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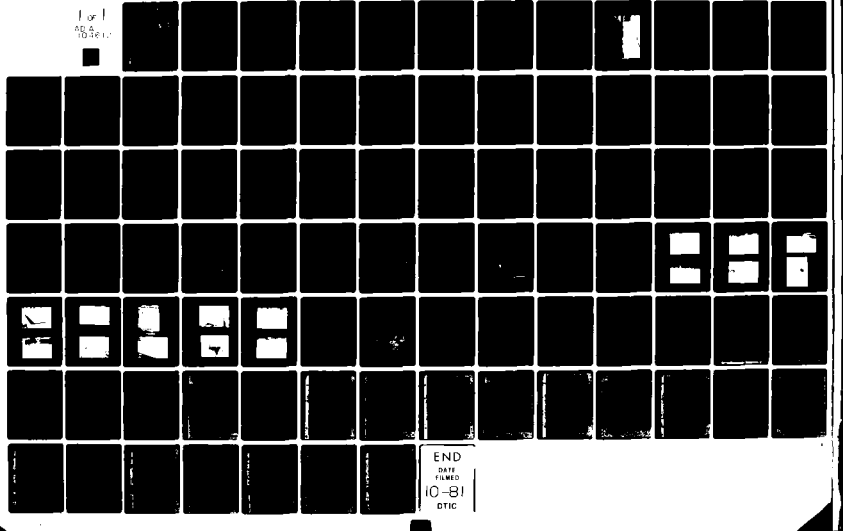

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MISSISSIPPI·SALT·QUINCY RIVER BASIN

SHELBYVILLE LAKE DAM
SHELBY COUNTY, MISSOURI
MO. 10028

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This report was prepared under the National Program of Inspection of Non-Federal Dams. This report assesses the general condition of the dam with respect to safety, based on available data and on visual inspection, to determine if the dam poses hazards to human life or property.

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DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
210 TUCKER BOULEVARD, NORTH
ST. LOUIS, MISSOURI 63101

REPLY TO ATTENTION OF

LMSED-P

29 February 1980

SUBJECT: Shelbyville Lake Dam, Phase I Inspection Report

This report presents the results of field inspection and evaluation of the Shelbyville Lake Dam.

It was prepared under the National Program of Inspection of Non-Federal Dams.

This dam has been classified as unsafe, non-emergency by the St. Louis District as a result of the application of the following criteria:

a. Spillway will not pass 50 percent of the Probable Maximum Flood.

b. Overtopping of the dam and/or erosion of the spillway could result in failure of the dam.

c. Dam failure significantly increases the hazard to loss of life downstream.

d. The 10-year frequency flood will overtop a small depressed area (emergency spillway) near the right abutment.

Submitted By: SIGNED
Chief, Engineering Division

29 FEB 1980
Date

Approved By: SIGNED
Colonel, CE, District Engineer

29 FEB 1980
Date

SHELBYVILLE LAKE DAM
SHELBY COUNTY, MISSOURI

MISSOURI INVENTORY NO. 10028

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

PREPARED BY
CONSOER, TOWNSEND AND ASSOCIATES, LTD.
ST. LOUIS, MISSOURI
AND
ENGINEERING CONSULTANTS, INC.
ENGLEWOOD, COLORADO
A JOINT VENTURE

UNDER DIRECTION OF
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
FOR
GOVERNOR OF MISSOURI

DECEMBER 1979

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: Shelbyville Lake Dam, Missouri Inv. No. 10028
State Located: Missouri
County Located: Shelby
Stream: An unnamed tributary of the Black Creek
Date of Inspection: August 23, 1979

Assessment of General Condition

Shelbyville Lake Dam was inspected by the engineering firms of Consoer, Townsend and Associates, Ltd., and Engineering Consultants, Inc. (A Joint Venture) of St. Louis, Missouri according to the "Recommended Guidelines for Safety Inspection of Dams". These guidelines were developed by the Chief of Engineers, U.S. Army, Washington, D.C., with the help of Federal and State agencies, professional engineering organizations, and private engineers. The resulting guidelines are considered to represent a consensus of the engineering profession.

Based on criteria in the guidelines, the dam is in the high hazard potential classification, which means that loss of life and appreciable property loss could occur in the event of failure of the dam. Within the estimated damage zone of three miles downstream of the dam are three dwellings and two highway crossings, which may be subjected to flooding, with possible damage and/or destruction, and possible loss of life. Shelbyville Lake

Dam is in the small size classification since it is less than 40 feet high and impounds less than 1,000 acre-feet of water.

Our inspection and evaluation indicates that the spillway of Shelbyville Lake Dam does not meet the criteria set forth in the guidelines for a dam having the above size and hazard potential. Shelbyville Lake Dam being a small size dam, with a high hazard potential, is required by the guidelines to pass from one-half of the Probable Maximum Flood to the Probable Maximum Flood without overtopping. Since there is high hazard potential downstream of the dam, the appropriate spillway design flood for this dam is the Probable Maximum Flood. It was determined that the reservoir/spillway system can accommodate 12 percent of the Probable Maximum Flood without overtopping the dam. Our evaluation indicates that the reservoir/spillway system will not accommodate the 10-year flood without overtopping.

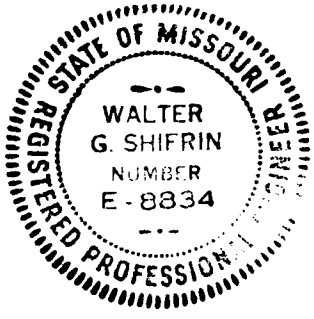
The Probable Maximum Flood is defined as the flood discharge that may be expected from the most severe combination of critical meteorological and hydrologic conditions that are reasonably possible in the region. The 10-year flood is defined as a flood having a ten percent chance of being equalled or exceeded during any given year.

Other deficiencies noted by the inspection team were: the sparse grass cover on the dam embankment; the erosion on the upstream embankment slope adjacent to the spillway; a cavity behind the left retaining wall of the spillway; the deterioration of the concrete of the retaining wall of the spillway; a tree growing on the upstream slope; the trees on the downstream channel; the deterioration of the riprap protection on the upstream embankment slope; the erosion of the downstream channel just downstream of the spillway; the erosion behind the downstream end of the right retaining wall of the spillway; a need for periodic inspection by a

qualified engineer and a lack of maintenance schedule. The lack of stability and seepage analyses on record is also a deficiency that should be corrected.

It is recommended that the owner take action to correct or control the deficiencies described above.

Walter G. Shifrin, P.E.



Overview of Shelbyville Lake Dam

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

SHELBYVILLE LAKE DAM, I.D. No. 10028

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

SHELBYVILLE LAKE DAM, Missouri Inv. No. 10028

SECTION 1: PROJECT INFORMATION

1.1 General

a. Authority

The Dam Inspection Act, Public Law 92-367 of August, 1972, authorizes the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspections. Inspection for Shelbyville Lake Dam was carried out under Contract DACW 43-79-C-0075 between the Department of the Army, St. Louis District, Corps of Engineers, and the engineering firms of Consoer, Townsend & Associates Ltd., and Engineering Consultants, Inc. (A Joint Venture), of St. Louis, Missouri.

b. Purpose of Inspection

The visual inspection of Shelbyville Lake Dam was made on August 23, 1979. The purpose of the inspection was to make a general assessment as to the structural integrity and operational adequacy of the dam embankment and its appurtenant structures.

c. Scope of Report

This report summarizes available pertinent data relating to the project; presents a summary of visual observations made during the field inspection; presents an assessment of hydrologic and hydraulic conditions at the site; presents an assessment as to the structural adequacy of the various project features; and assesses the general condition of the dam with respect to safety.

Subsurface investigations, laboratory testing, and detailed analyses were not within the scope of this study. No warranty as to the absolute safety of the project features is implied by the conclusions presented in this report.

It should be noted that reference in this report to left or right abutments is as viewed looking downstream. Where left abutment or left side of the dam is used in this report, this also refers to the south abutment or side, and right to the north abutment or side.

d. Evaluation Criteria

Criteria used to evaluate the dam were furnished by the Department of the Army, Office of the Chief of Engineers, in the publication "Recommended Guidelines for Safety Inspection of Dams", Appendix D. These guidelines were developed with the help of several Federal agencies and many State agencies, professional engineering organizations, and private engineers.

1.2 Description of the Project

a. Description of Dam and Appurtenances

It should be noted that design drawings are not available for the dam or appurtenant structures. The following description is based exclusively on observations and measurements made during the visual inspection.

The dam is an earthfill structure between earth abutments. The crest width of the embankment is 16 feet with a length of 600 feet. The lowest point on the dam crest is approximately 728 feet above MSL. The maximum height of the structure was 16 feet. The upstream slope varies from 1V to 3.75H to 1V to 2.75H as measured from the crest to the water surface. Riprap was provided as slope protection on the upstream slope. The downstream slope varies from 1V to 2.75H to 1V to 1.9H.

The spillway for the Shelbyville Lake Dam is a cut into the left abutment. The spillway is an uncontrolled, rectangular concrete weir with a concrete lined chute. The control section of the spillway has a bottom width of 50 feet and a crest width of 1.5 feet. Discharge through the weir drops 2.4 feet vertically into a 97 foot long concrete lined chute with vertical retaining walls. Energy dissipators were constructed at the downstream end of the chute.

A regulated outlet works used in the Shelbyville water supply system was provided for the dam. The water supply system associated with the dam consists of a centrifugal pump which draws water from the reservoir through a 4 inch half cast iron and half P.V.C. pipe. The 4 inch line runs from the water treatment plant located on the left abutment to a concrete standpipe located in the reservoir. The pump is located in the water treatment plant and has a capacity of 125

gpm. An 8-inch cast iron pipe with flexible connection with the standpipe is used as the intake for the standpipe. The invert of the 8-inch pipe is controlled by a hand operated winch mounted on a wood piling tower.

No low level drain was provided for the dam.

b. Location

The Shelbyville Lake Dam is located on an unnamed tributary of the Black Creek in Shelby County, Missouri. The nearest community is Shelbyville, which is about half a mile east of the damsite. The dam and lake are shown on the Shelbyville, Missouri Quadrangle Sheet (7.5 minute series) in Sections 19 and 20, Township 58 North, Range 10 West.

c. Size Classification

According to the "Recommended Guidelines for Safety Inspection of Dams", by the U.S. Department of the Army, Office of the Chief Engineer, the dam is classified in the dam size category as being "Small", since its storage is less than 1,000 acre-feet. The dam is also classified as "Small" in dam size category because its height is less than 40 feet. The overall size classification is, accordingly, "Small" in size.

d. Hazard Classification

The dam has been classified as having "High" hazard potential in the National Inventory of Dams, on the basis that in the event of failure of the dam or its appurtenances, excessive damage could occur to downstream property, together with the possibility of the loss of life. Our findings concur with the classification. The estimated damage zone extends approximately three miles downstream of the dam. Within the possible damage zone are three dwellings and two highway crossings, State Highway 15 and County Highway K.

e. Ownership

The Shelbyville Lake Dam is owned by the City of Shelbyville. The mailing address is City of Shelbyville, c/o David Kiser, Shelbyville City Hall, Shelbyville, Missouri, 63469.

f. Purpose of Dam

The main purpose of the dam is to impound water for water supply and recreational use.

g. Design and Construction History

Shelbyville Lake Dam was designed in 1955 by Frank Beard, Engineer, Kakoka Missouri and H.W. Thomas, Engineer, Salisbury, Missouri. According to the water superintendent, Mr. David Kiser, the dam was built in 1956 by Hardy Construction Company of Shelbyville, Missouri.

The inspection team was informed by the water superintendent that in 1976 the original spillway crest had deteriorated extensively and a new structure was proposed.

The reconstruction was performed in that same year also by Hardy Construction Company of Shelbyville, Missouri.

In 1973 a sludge settlement pond was designed by Crane & Fleming, Engineers of Hannibal, Missouri. According to the Water Superintendent, the pond (located behind the treatment building) is no longer in use due to water quality violations.

h. Normal Operational Procedures

The reservoir is used daily as a source of water for Shelbyville, Missouri. The water superintendent, Mr. David Kiser, is at the facility daily and operates the water treatment plant.

There is, however, no specific procedures for the operation of the spillway. The water level below the spillway crest is controlled by rainfall, runoff, evaporation, and quantities drawn for consumption by the City of Shelbyville, Missouri.

1.3 Pertinent Data

a. Drainage Area (square miles):		1.81
b. Discharge at Damsite		
Estimated experienced maximum flood (cfs):		NA
Estimated ungated spillway capacity with reservoir at top of dam elevation (cfs):		863
c. Elevation (Feet above MSL)		
Top of dam (lowest point on the dam crest):		728
Spillway crest:		725 (assumed)
Normal Pool:		725
Maximum Pool (PMF):		731.11
d. Reservoir		
Length of pool with water surface at top of dam elevation (feet):		5,000
e. Storage (Acre-Feet)		
Top of dam:		211
Spillway crest:		97
Normal Pool:		97
Maximum Pool (PMF):		434
f. Reservoir Surface (Acres)		
Top of dam:		48
Spillway crest:		29
Normal Pool:		29
Maximum Pool (PMF):		95
g. Dam		
Type:	Earthfill	
Length:	600 feet	
Structural Height:	16 feet	

Hydraulic Height:	16 feet
Top width:	16 feet
Side slopes:	
Downstream	Varies from 1V to 2.75H to 1V to 1.9H
Upstream	Varies from 1V to 3.75H to 1V to 2.75H (Crest to water surface)
Zoning:	Unknown
Impervious core:	Unknown
Cutoff:	Unknown
Grout curtain:	Unknown

h. Diversion and Regulating Tunnel None

i. Spillway

Type:	Rectangular weir, uncontrolled
Length of crest:	50 feet
Crest Elevation (feet above MSL):	725.0 (assumed)

j. Regulating Outlets

Type:	Water Supply System
Length:	Unknown
Closure:	Centrifugal pump
Maximum Capacity:	125 gpm

SECTION 2 : ENGINEERING DATA

2.1 Design

No original or as-built design plans were available for this dam. However, a copy of the original project specifications dated December 6, 1955 was made available by the city water superintendent David Kiser.

2.2 Construction

No pertinent construction data were available for Shelbyville Lake Dam.

2.3 Operation

No operational data were available for Shelbyville Lake Dam.

2.4 Evaluation

a. Availability

Only the set of project specifications was made available for review for this report.

In addition, no pertinent data were available for review of hydrology, spillway capacity, flood routing through the reservoir, outlet capacity, slope stability, seepage analyses or foundation conditions.

b. Adequacy

The lack of engineering data did not allow for a definitive review and evaluation. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing and evaluating design, operation and construction data, but was based primarily on visual inspection, past performance history, and sound engineering judgement.

Seepage and stability analyses comparable to the requirements of the "Recomended Guidelines for Safety Inspection of Dams" were not available which is considered a deficiency. These seepage and stability analyses should be performed for appropriate loading conditions and made a matter of record.

c. Validity

No valid engineering data were available.

SECTION 3: VISUAL INSPECTION

3.1 Findings

a. General

A visual inspection of the Shelbyville Lake Dam was made on August 23, 1979. The following persons were present during the inspection:

Name	Affiliation	Disciplines
Dr. M.A. Samad	Engineering Consultants, Inc.	Project Engineer, Hydraulics and Hydrology
Mark R. Haynes	Engineering Consultants, Inc.	Civil, Structural and Mechanical
Dawn L. Jacoby	Engineering Consultants, Inc.	Soils
Peter L. Strauss	Engineering Consultants, Inc.	Geology
Kevin Blume	Consoer, Townsend & Assoc., Ltd.	Civil and Structural
David Kiser	City of Shelbyville	Water Plant Superintendent

Mike Brook	City of Shelbyville	Water Plant Employee

Specific observations are discussed below.

b. Dam

The dam is in satisfactory condition. The dam crest is covered by grass. In some sections the grass cover is thin and consequently, some minor surface erosion is occurring. No significant deviations in the vertical or horizontal alignment were observed. No cracks were observed. According to Mr. David Kiser, the dam has never been overtopped and there was no evidence indicating the contrary.

The dam embankment had recently been mowed prior to the visual inspection. Some depressions were observed on the upstream and downstream slopes which appeared to be formed by the tractor used to perform the maintenance. They do not present a structural problem.

The upstream slope has riprap protection which appears to have extended to the crest at one time. The riprap consists of limestones with a maximum size of 12 inches. Several areas were observed in which the limestone was deteriorating. An area adjacent to the spillway has been cut back by wave erosion and discharges through the spillway. One large tree was growing on the slope near the right abutment. Numerous stumps of large bushes were seen along the entire length of the dam. There were signs of abundant rodent activity on the upstream and downstream slopes. No cracks were observed.

The downstream slope is not adequately protected from surface erosion. Vegetative cover is sparse and consequently, small erosion paths are forming down the face of the slope. Material taken from below the surface was a silty clay. No cracks were observed. No seepage was observed.

The spillway is a cut into the left abutment. A portion of the dam at the right abutment is slightly lower than the rest of the crest. The right abutment supports an embankment for a stock pond located on the abutment. No instability or seepage was observed in or around either abutment.

According to the "Missouri General Soil Map and Soil Association Description" published by the Soil Conservation Service, the materials in the general area of the dam belong to the soil series of Mexico-Leonard-Armstrong-Lindley in the Central Claypan Area forest. The soils are basically formed from loess and glacial till. The permeability of these soils range from slow to moderately slow.

d. Project Geology

The damsite is physiographically located in the Dissected Till Plains Section of the Central Lowlands Physiographic Province, according to Nevin Fenneman's "Physiography of the Eastern United States". This section is distinguished from the Young Drift section on the north and from the Till Plains on the east by the stage it has reached in the post-glacial erosion cycle. Broadly generalized, this section is a nearly flat till plain submature to mature in its erosion cycle.

No faults have been identified in the vicinity of the dam.

Some minor folding has been identified in Shelby County. The closest trace of a fold to the damsite is twelve miles to the northeast where the northwest trending Lincoln Fold occurs. The Lincoln Fold had its last movement in Late Paleozoic. This minor structure has no effect on the dam.

The site bedrock geology, beneath the drift, as shown on the Geologic Map of Missouri, (1979), is interbedded Pennsylvanian age shales, limestones, sandstones. These strata generally strike north-south and dip gently to the west.

No bedrock was seen at or in the vicinity of the damsite. The entire area is mantled by glacial drift.

d. Appurtenant Structures

(1) Spillway

The overall condition of the spillway is excellent except for one area. Behind the left retaining wall approximately 30 feet from the downstream end of the spillway chute, a cavity approximately one cubic yard in size has been formed. The cavity was created by the discharges through a drain which drains the settling ponds of the water treatment plant. The settling ponds can be drained by gravity. The drain consists of an 8 inch clay pipe which discharges into the spillway chute through the left retaining wall. A joint of the 8 inch pipe near the downstream end has separated and discharges through the pipe have eroded away the backfill. Some spalling of the concrete of the wall was observed near the discharge end of the drain. Cracking and spalling of the concrete and one exposed reinforcement bar was observed at the top of the wall in front of the cavity. One small offset at a joint of

the wall just downstream of the end of the drain and a loss of joint material were observed.

No other areas in the spillway exhibited signs of spalling or cracking of the concrete. The retaining walls of the spillway chute appeared to be stable. Ten slab drains were provided for the slab of the chute and on the day of the inspection four of them were seeping. No deterioration of the energy dissipators was observed. Discharges through the spillway have eroded the material away from the downstream end of the chute. Nevertheless, the chute is not being undermined since a cutoff wall was provided. A small eroded area behind the right retaining wall at the downstream end was observed.

(2) Outlet Works

The water supply system is reportedly operable. On the day of the inspection, the pump in the water treatment plant was operating.

e. Reservoir Area

The water surface elevation was at 723.5 feet above MSL on the day of the inspection.

The slopes along the reservoir rim are gently sloped with a good grass protection. No evidence of instability or erosion of the slopes was readily apparent. A few dwellings were built around the reservoir rim.

f. Downstream Channel

The downstream channel is a well defined earth channel. The channel is a 20 feet wide and 5 feet deep having side slopes approximately 1V to 2H. Several trees are growing in the channel just downstream of the end of the spillway.

3.2 Evaluation

The visual inspection did not reveal any items which are sufficiently significant to indicate a need for immediate remedial action. However, the remedial measures in Section 7.2b should be undertaken within a reasonable period of time.

SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedures

Shelbyville Lake Dam is used primarily for water supply for the City of Shelbyville and also for recreation by local residents. No specific operational procedures were in effect for this dam.

4.2 Maintenance of Dam

The dam is maintained by the water superintendent, Mr. David Kiser along with Mr. Mike Brooks of the Water Department Maintenance crew.

Both downstream and upstream slopes, along with the dam crest seem to be kept in fair condition. According to Mr. Kiser, about two years ago all trees, saplings and brush were cleared off the embankment slopes and crest.

There were indications of extensive rodent activity on the upstream slope.

Approximately fifteen feet from the end of the south spillway wall there was an erosion cavity one cubic yard in size, which resulted from a broken drain pipe leading back to the water treatment plant.

4.3 Maintenance of Operating Facilities

The individuals mentioned in Section 4.2 are also reponsible for maintenance of the operating facility, which is a pump associated with the water supply line. The pump is in operable condition.

4.4 Description of Any Warning System in Effect

The inspection team is not aware of any warning system in effect.

4.5 Evaluation

The operation and maintenance for Shelbyville Lake Dam seems to be adequate at this time. However, the remedial measures listed in Section 7 should be undertaken within a reasonable period of time.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design

The watershed area of the Shelbyville Lake Dam upstream from the dam axis consists of approximately 1,156 acres. The watershed area is mostly pasture and range land. Land gradients in the higher regions of the watershed average roughly 2 percent, and in the lower areas surrounding the reservoir average about 12 percent. The Shelbyville Lake Dam is located on the headwaters of an unnamed tributary to Black Creek. The reservoir is about 0.24 mile upstream from the confluence of the unamed tributary and Black Creek. At its longest arm the watershed is approximately 1/4 mile long. A drainage map showing the watershed is presented as Plate 1 in Appendix B.

Evaluation of the hydraulic and hydrologic features of Shelbyville Lake Dam was based on criteria set forth in the Corps of Engineers' "Recommended Guidelines for Safety Inspection of Dams", and additional guidance provided by the St. Louis District of the Corps of Engineers. The Probable Maximum Flood (PMF) was calculated from the Probable Maximum Precipitation (PMP) using the methods outlined in the U.S. Weather Bureau Publication, Hydrometeorological Report No. 33. The probable maximum storm duration was set at 24 hours, and storm rainfall distribution was based on criteria given in the Corps of Engineers' EM 1110-2-1411 (Standard Project Storm). The Soil Conservation Service (SCS) method was used for deriving the unit hydrograph, utilizing the Corps of Engi-

neers' computer program HEC-1 (Dam Safety Version). The unit hydrograph parameters are presented in Appendix B. The SCS method was also used for determining the loss rate. The hydrologic soil group of the watershed was determined by use of published soil maps. The hydrologic soil group of the watershed and the SCS curve number are presented in Appendix B. The curve number, the unit hydrogrpah parameters, the PMP index rainfall and the percentages for various durations were directly input to the HEC-1 (Dam Safety Version) computer program to obtain the PMF hydrograph. The computed peak discharges of the PMF and one-half of the PMF are 10,986 cfs and 5,483 cfs, respectively.

Both the PMF and one-half of the PMF inflow hydrographs were routed through the reservoir by the Modified Puls Method also utilizing the HEC-1 (Dam Safety Version) computer program. The reservoir was assumed at the spillway crest level at the start of the routing computation. The peak outflow discharges for the PMF and one-half of the PMF are 9,728 and 5,111 cfs, respectively. Both the PMF and one-half of the PMF when routed through the reservoir resulted in overtopping of the dam.

The size of physical features utilized to develop the stage-outflow relation for the spillway and overtopping of the dam were determined from field notes, and sketches, prepared during the field inspection. The reservoir stage-capacity data were based on the Shelbyville, Missouri Quadrangle topographic map (7.5 minute series). The spillway and dam overtop rating curve and the reservoir capacity curve are presented in Plates 2 & 3, respectively, in Appendix B.

From the standpoint of dam safety, the hydrologic design of a dam must aim at avoiding overtopping. Overtopping is especially dangerous for an earth dam because of its erosive characteristics. The safe hydrologic design of an

embankment dam requires a spillway discharge capability, in combination with an embankment crest height that can handle a very large and exceedingly rare flood without dam overtopping.

The Corps of Engineers design dams to safely pass the Probable Maximum Flood that is estimated could be generated from the dam's watershed. This is the generally accepted criterion for major dams throughout the world, and is the standard for dam safety where overtopping would pose any threat to human life. Accordingly, the hydrologic requirement for safety for this dam is the capaiblity to pass the Probable Maximum Flood without overtopping.

b. Experience Data

It is believed that records of reservoir stage or spillway discharge are not maintained for this site.

c. Visual Observations

Observations made of the spillway during the visual inspection are discussed in Section 3.1c(1) and evaluated in Section 3.2.

d. Overtopping Potential

As indicated in Section 5.1a, both the Probable Maximum Flood and one-half of the Probable Maximum Flood, when routed through the reservoir, resulted in overtopping of the dam. The peak outflow discharges for the PMF and one-half of the PMF are 9,728 and 5,111 cfs, respectively. The PMF overtopped the dam crest by 3.11 feet and one-half of the PMF overtopped the dam crest by 1.87 feet. The total duration of embankment overflow is 9.25 hours during the PMF, and 6.08 hours during one-half of the PMF. The spillway/reservoir system of Shelbyville Lake Dam is capable of accommodating a

flood equal to approximately 12 percent of the PMF before overtopping the dam.

The computed one percent and ten percent chance floods using 100- and 10-year, 48 hour rainfall data were routed through the reservoir. The routing results indicate that the 100-year flood and the 10-year flood will overtop the dam by 1.11 feet and 0.34 feet respectively.

The failure of the dam could cause extensive damage to the property downstream of the dam and possible loss of life. The estimated damage zone extends approximately three miles downstream of the dam. Within the damage zone are three dwellings, and two highway crossings, State Highway 15 and County Highway K.

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

There were no signs of instability observed on the embankment during the visual inspection. The embankment crest and downstream slope are unprotected from surface erosion in several areas. An area on the upstream slope adjacent to the spillway is eroding from wave action and discharges through the spillway. These conditions are not serious at this time, but it is recommended that these conditions be checked and corrective measures undertaken as required. In the absence of seepage and stability analyses, no quantative evaluation of the structural stability of the dam can be made.

The overall structural stability of the spillway appears to be good except for the area at the left retaining wall near the discharge end of the drain from the pumphouse.

b. Design and Construction Data

No design computations were uncovered during the report preparation phase. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available. No embankment or foundation soil parameters are available for carrying out a conventional stability analysis on the embankment. No construction data or specifications relating to the degree of embankment compaction are available for use in a stability analysis.

c. Operating Records

No operating records are available relating to the stability of the dam or appurtenant structures. The water level on the day of the inspection was 1 foot 6 inches below the crest of the spillway, and it is assumed that the reservoir remains close to full at all times. The water supply system is operational.

d. Post Construction Changes

In 1976 the original spillway crest was replaced with a new crest structure due to extensive deterioration of the old crest. A sludge settlement pond was excavated after the dam was built. The pond located behind the water treatment plant is no longer in use due to water quality violations. These post construction changes will not affect the structural stability of the dam.

e. Seismic Stability

The dam is located in Seismic Zone 1, as defined in "Recommended Guidelines For Safety Inspection of Dams" as prepared by the Corps of Engineers. An earthquake of the magnitude expected in a seismic zone 1 should not cause significant distress to a well designed and constructed earth dam.

SECTION 7: ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment

The assessment of the general condition of the dam is based upon available data and visual inspection. Detailed investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation, however, the investigation is intended to identify any need for such studies.

It should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team.

It is also important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be assurance that an unsafe condition could be detected.

a. Safety

The spillway capacity of Shelbyville Lake Dam was found to be "Seriously Inadequate". The spillway/reservoir system will accommodate only 12 percent of the PMF without overtopping the dam. The surface soil on the dam is a silty clay. The dam is overtopped by over 3 feet during the PMF and the duration of embankment overflow is over 9 hours. If the body of the dam is made of silty soils, the dam would be susceptible to erosion and failure during overtopping.

No quantative evaluation of the safety of the embankment can be made in view of the absence of seepage and stability analyses. The present embankment, however, has reportedly performed adequately since its construction without failure or evidence of instability. Reportedly, the dam has never been overtopped and there was no evidence indicating the contrary.

The tree observed on the upstream slope poses a potential danger to the safety of the dam depending upon the extent of the root system. The roots present possible paths for piping through the embankment. The roots can also do damage to the embankment from being uprooted by a storm. Therefore, the tree and its root system should be removed from the embankment under the guidance of an engineer experienced in the design and construction of earthen dams.

The existence of burrowing animals on the embankment could jeopardize the safety of the dam. The holes created by the animals make avenues for possible piping. The extent of damage to the embankment done by the burrowing animals should be determined and corrective measures undertaken as required.

The following conditions were observed which could affect the safety of the dam and appurtenant structures: the sparse vegetation cover on the embankment; the erosion adjacent to the spillway on the upstream slope due to wave action and discharges through the spillway; the cavity behind the left retaining wall of the spillway; the deterioration of the concrete on the left retaining wall of the spillway; the trees in the downstream channel just downstream of the end of the spillway. Corrective measures for these conditions should be undertaken within a reasonable period of time.

The following conditions were observed which could affect the safety of the dam and appurtenant structures and they should be monitored and corrective measures undertaken as required: the deterioration of the riprap protection on the upstream slope; the erosion just downstream of the downstream end of spillway; the erosion behind the downstream end of the right retaining wall of the spillway.

b. Adequacy of Information

The conclusions presented in this report are based on field measurements, past performance and present condition of the dam. Information on the design hydrology, hydraulic design, and the operation and maintenance of the dam were not available. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were also not available, which is considered a deficiency.

c. Urgency

The remedial measures recommended in Paragraph 7.2 should be accomplished in the near future. The items recommended in Paragraph 7.2a should be pursued on a high priority basis.

d. Necessity for Phase II Inspection

Based on results of the Phase I inspection, and if the remedial measures recommended in Paragraph 7.2 are undertaken, a Phase II inspection is not felt to be necessary.

7.2 Remedial Measures

a. Alternatives

Spillway capacity and/or height of dam should be increased to accommodate the PMF without overtopping the dam.

b. O & M Procedures

1. The following corrective measures should be undertaken within a reasonable period of time:

(a) Provide more protective covering on the embankment in the areas of sparse grass cover to protect the embankment from erosion due to surface runoff.

(b) Repair the erosion adjacent to the spillway on the upstream slope and protect the area from further damage.

(c) Repair the cavity behind the left retaining wall of the spillway and protect the slope from further damage.

(d) Repair the deterioration of the concrete on the left retaining wall of the spillway.

(e) Remove the trees in the downstream channel just downstream of the end of the spillway.

(f) Remove the tree from the upstream slope. Removal of large tree should be under the guidance of an engineer experienced in the design and construction of earthen dams.

(g) Determine the extent of damage done to the embankment by burrowing animals, if any, and make corrective repairs as required.

(h) Seepage and stability analyses should be performed by a professional engineer experienced in the design and construction of earth dams.

2. The following conditions should be monitored and corrective repairs made as required:

(a) The deterioration of the riprap protection on the upstream slope.

(b) The erosion just downstream of the downstream end of the spillway.

(c) The erosion behind the downstream end of the right retaining wall of the spillway.

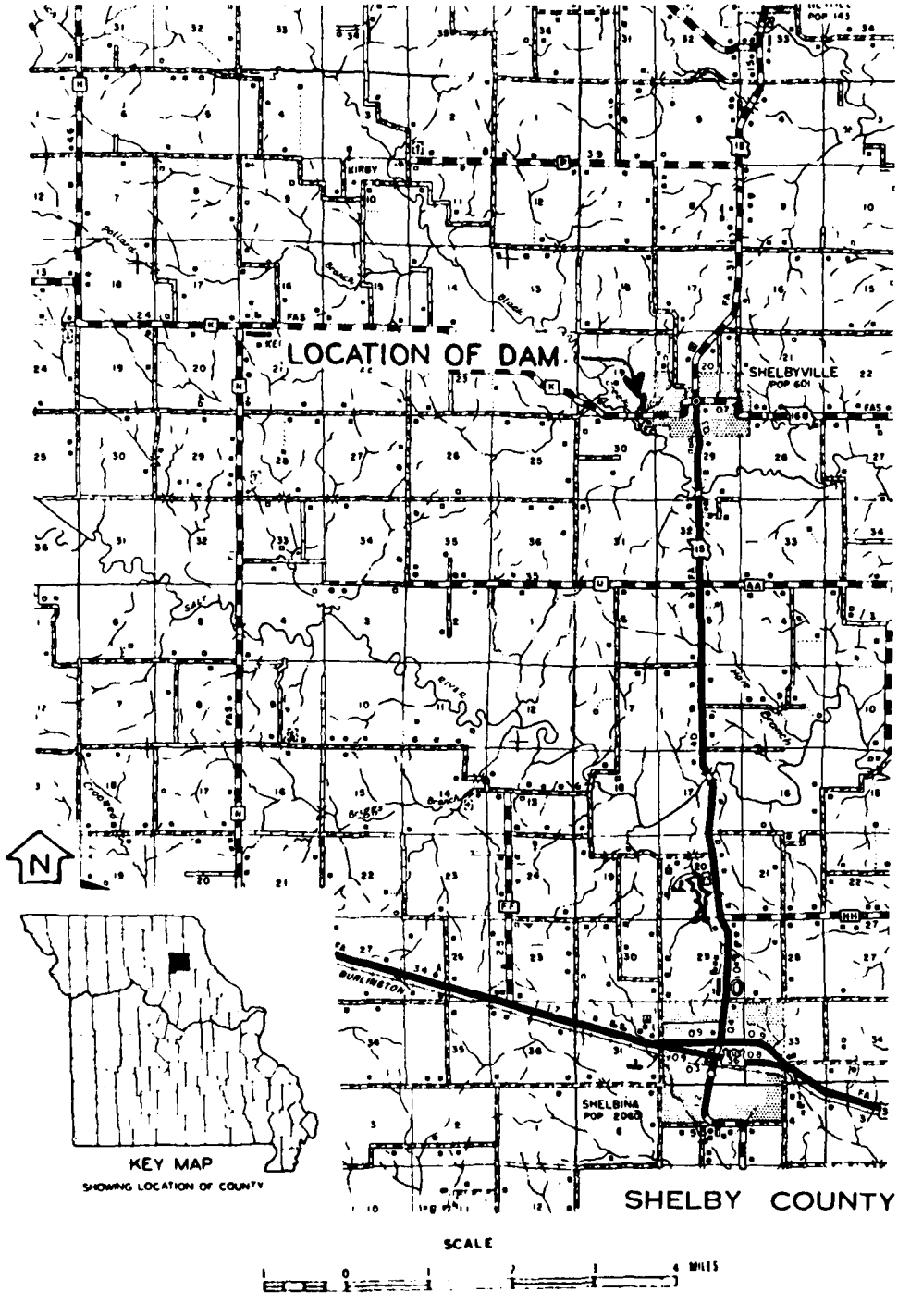
3. The owner should initiate the following programs:

(a) Periodic inspection of the dam by a professional engineer experienced in the design and construction of earthen dams.

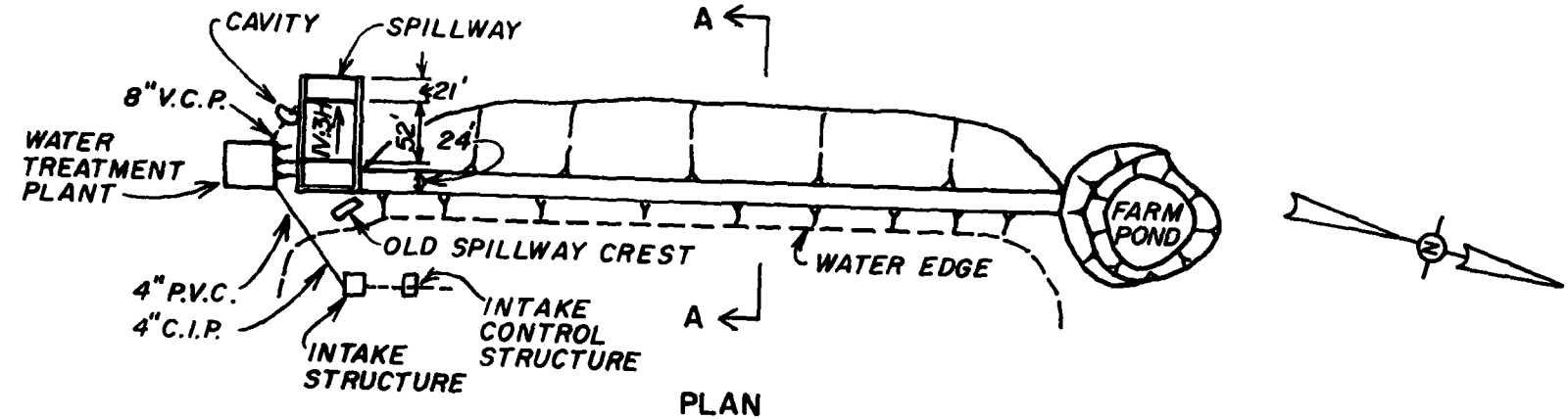
(b) Set up a maintenance schedule and log all visits to the dam for operation, repairs and maintenance.

PLATES

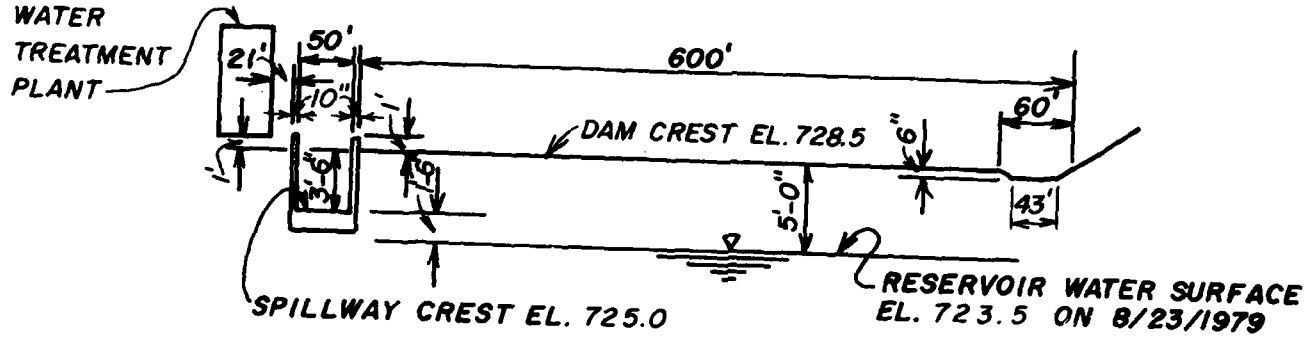
PLATE I



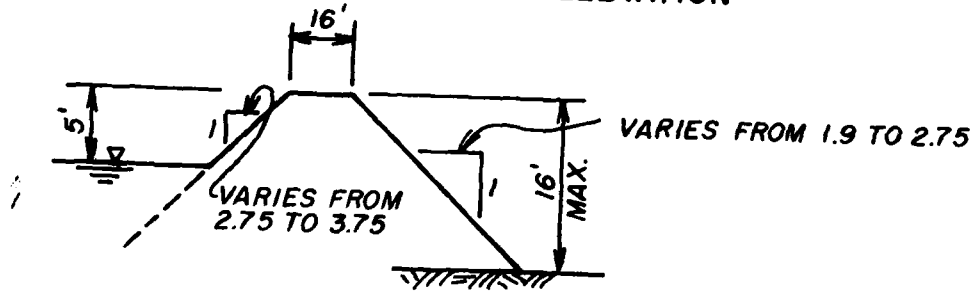
LOCATION MAP – SHELBYVILLE LAKE DAM



PLAN



ELEVATION



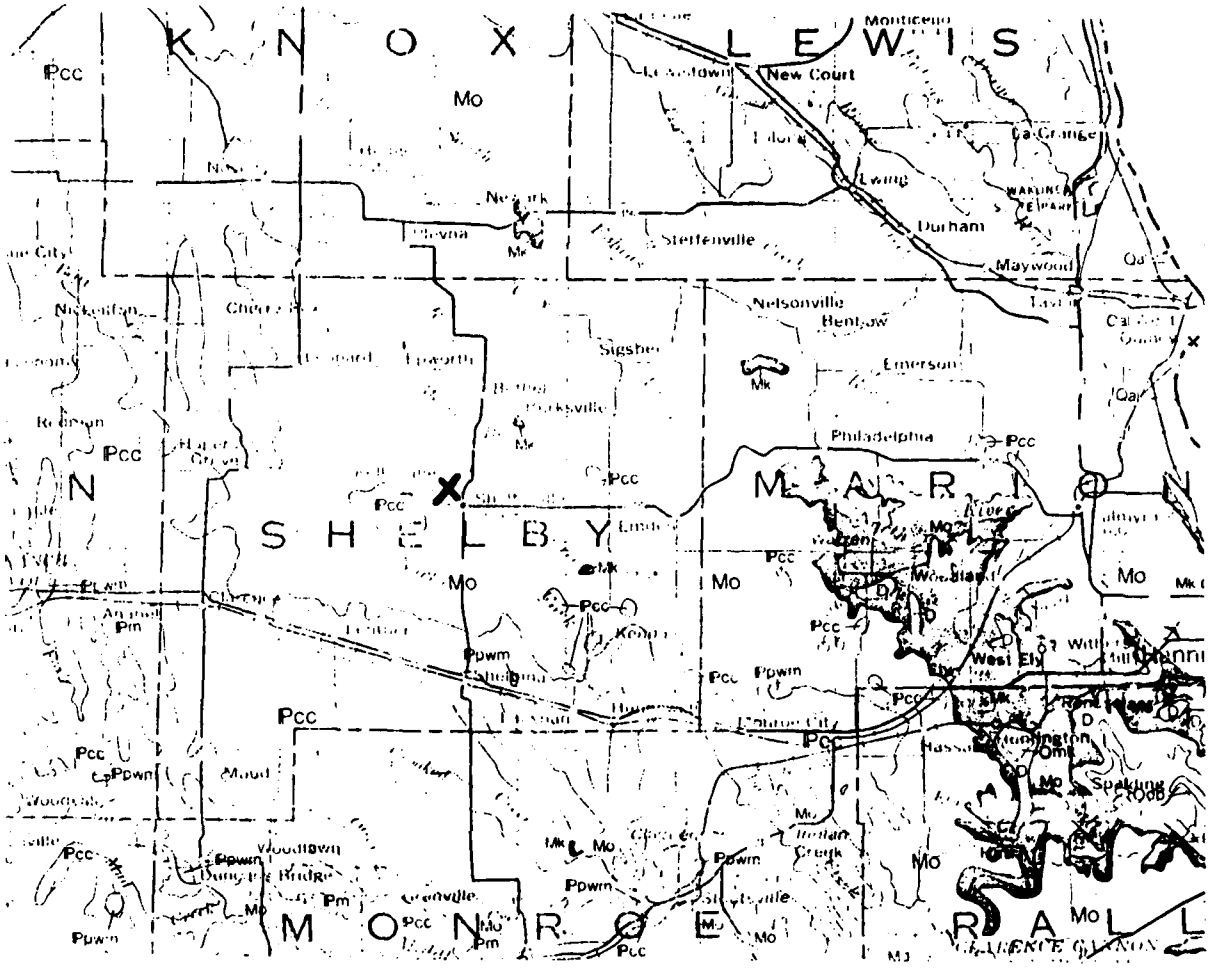
SECTION A-A
NOT TO SCALE

SCALE
1"=150' (HORIZONTAL)
VERTICAL (NOT TO SCALE)

SHELBYVILLE LAKE DAM (MO. 10028)
PLAN, ELEVATION & SECTION

PLATE 2

PLATE 3



PENNSYLVANIAN { IPm - MARMATON GROUP
IPcc - CHEROKEE GROUP, CABANISS SUBGROUP

MISSISSIPPIAN MO - OSAGEAN SERIES

X - LOCATION OF DAM, MO. 10028

REFERENCE:
GEOLOGIC MAP OF MISSOURI
MISSOURI GEOLOGIC SURVEY
1979

GEOLOGIC MAP OF SHELBY COUNTY AND ADJACENT AREA

From TM 5-809-10/ NAVFAC P-355/AFM 88-3, Chapter 13; April 1973

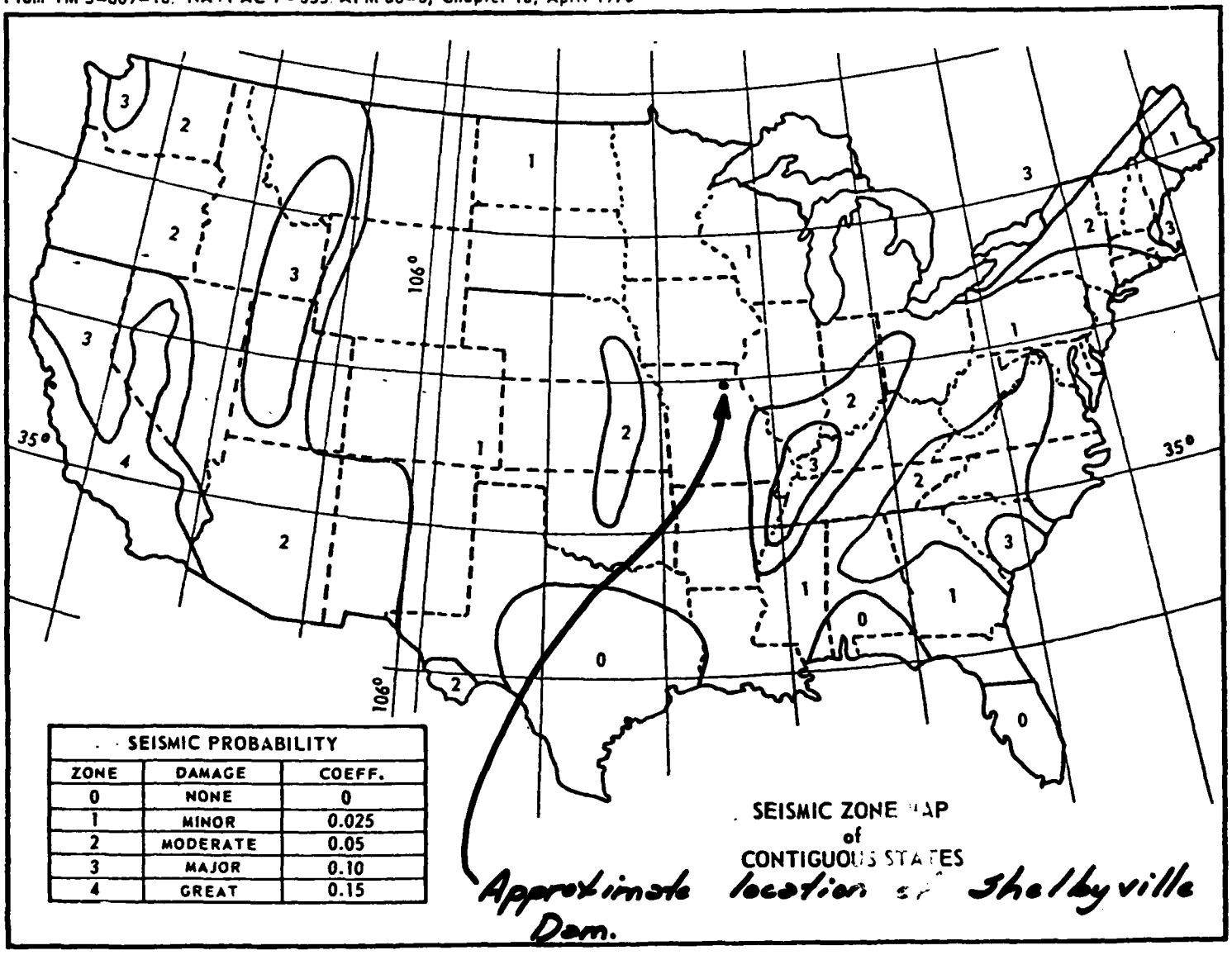


PLATE 4

APPENDIX A

PHOTOGRAPHS TAKEN DURING INSPECTION

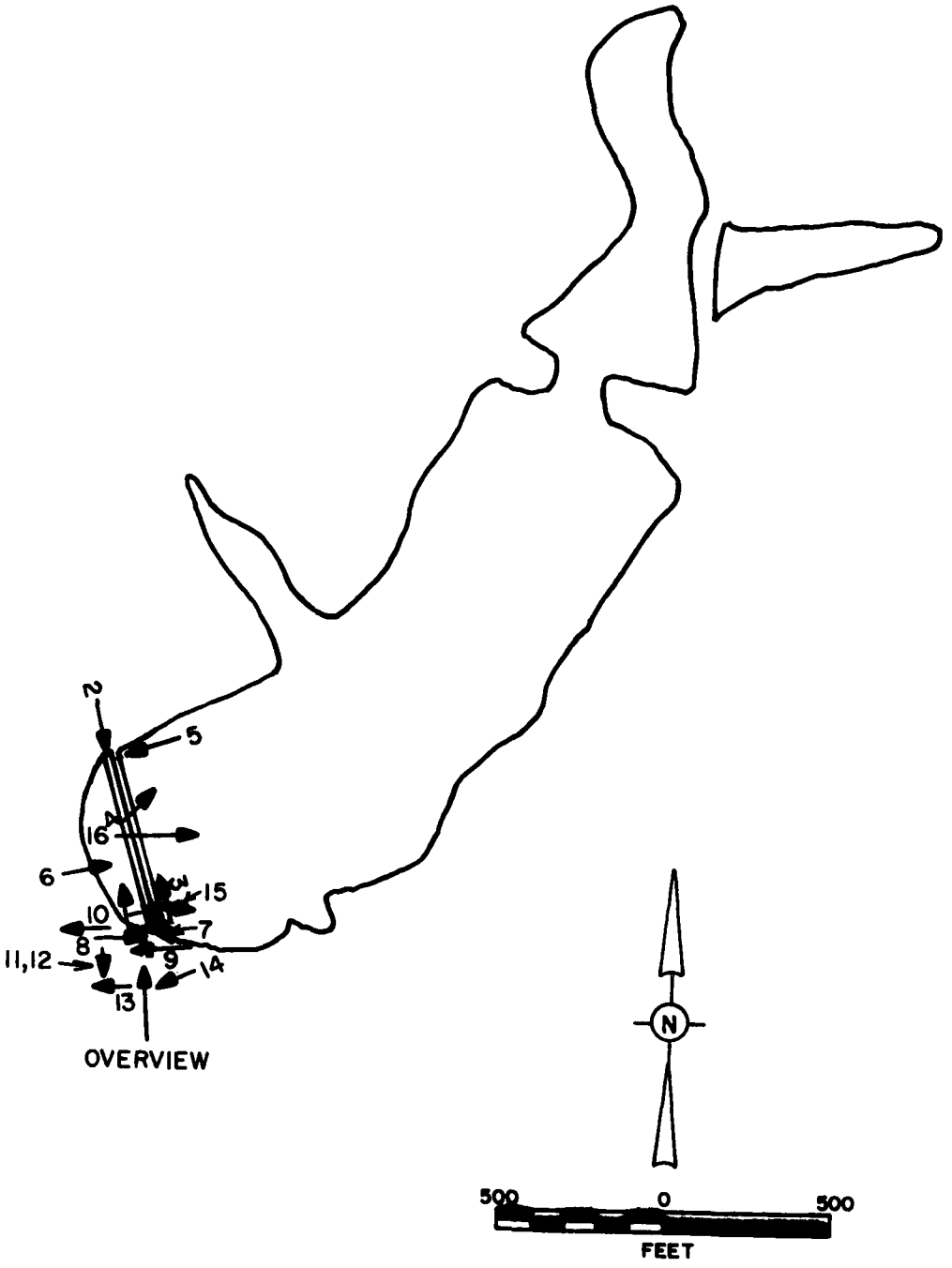


PHOTO INDEX FOR SHELBYVILLE LAKE DAM

Shelbyville Lake Dam

Photo 1. - View of the downstream slope of the embankment.

Photo 2. - View of the crest.

Photo 3. - View of the upstream slope of the embankment.

Photo 4. - Closeup view of the riprap on the upstream slope.

Photo 5. - View of the depression on the right abutment from upstream.

Photo 6. - Closeup view of erosion on the downstream slope caused by mowing equipment.

Photo 7. - View of the control section of the spillway.

Photo 8. - View of the discharge channel from downstream.

Photo 9. - View of the downstream channel. Note the energy dissipators at the end of the discharge channel.

Photo 10. - View of erosion behind the left retaining wall at the downstream end of the discharge channel.

Photo 11. - View of the outlet of the drain from the treatment plant. Note the spalling of the concrete and loss of joint material.

Photo 12. - View of the right retaining wall of the discharge channel near the outlet of the drain from the treatment plant. Note the deterioration of the concrete and the cavity in the background.

Photo 13. - View of the cavity behind the right retaining wall of the discharge channel.

Photo 14. - View of the pump in the water treatment plant.

Photo 15. - View of the concrete standpipe and wood piling tower with hand winch in the reservoir.

Photo 16. - View of the reservoir rim.

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

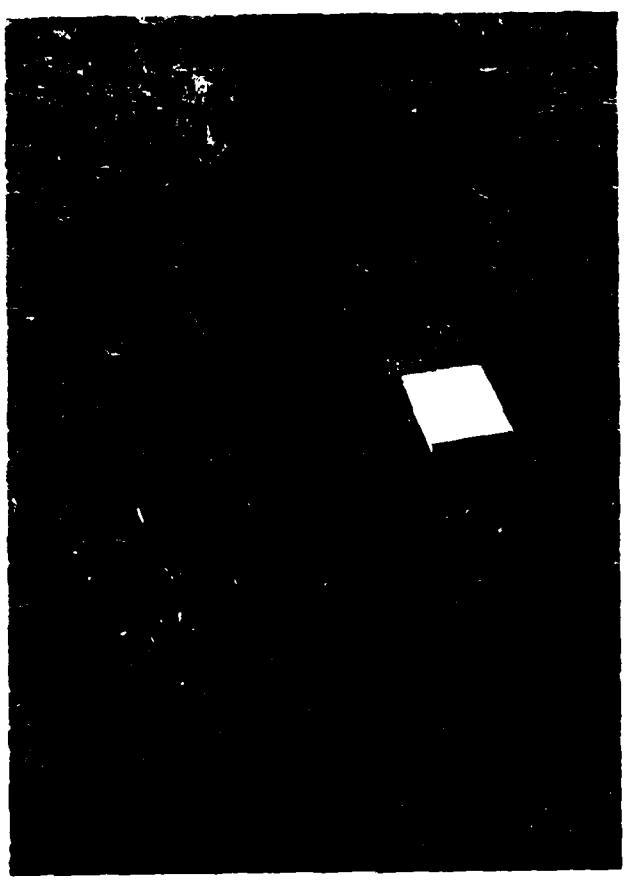


Photo 6

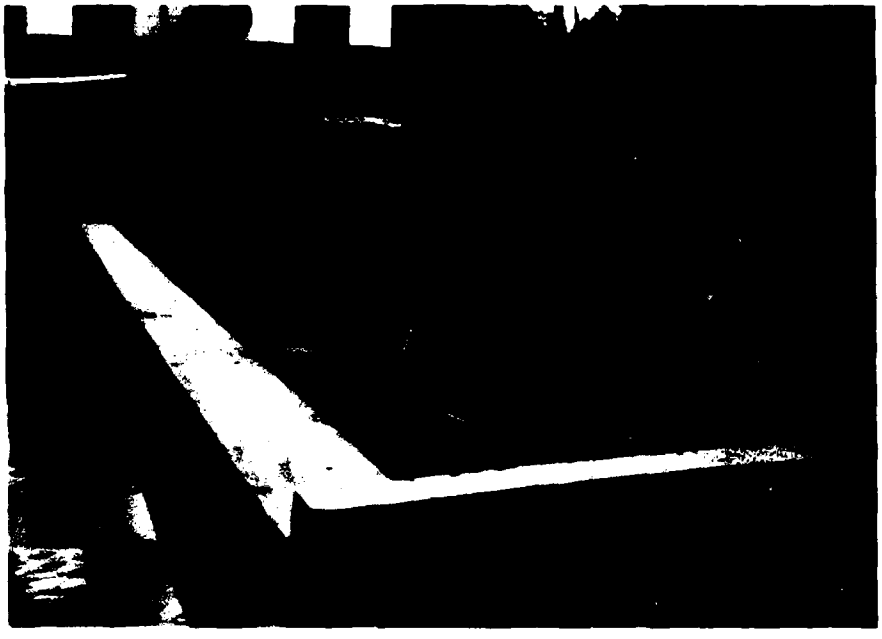


Photo 7

Photo 8

Shelbyville Lake Dam

Photo 9

Photo 10

Shelbyville Lake Dam

Photo 11

Photo 12

Photo 13

Photo 14

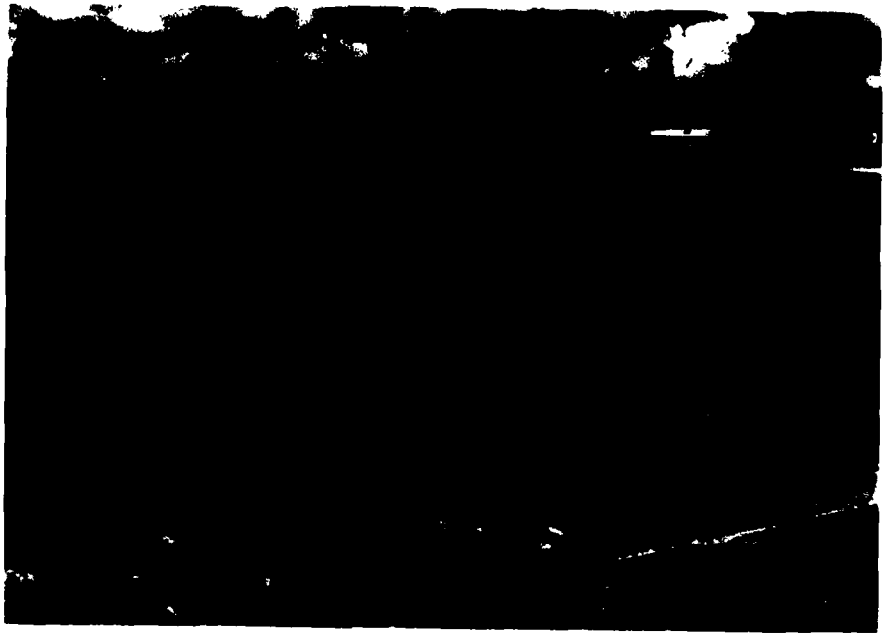


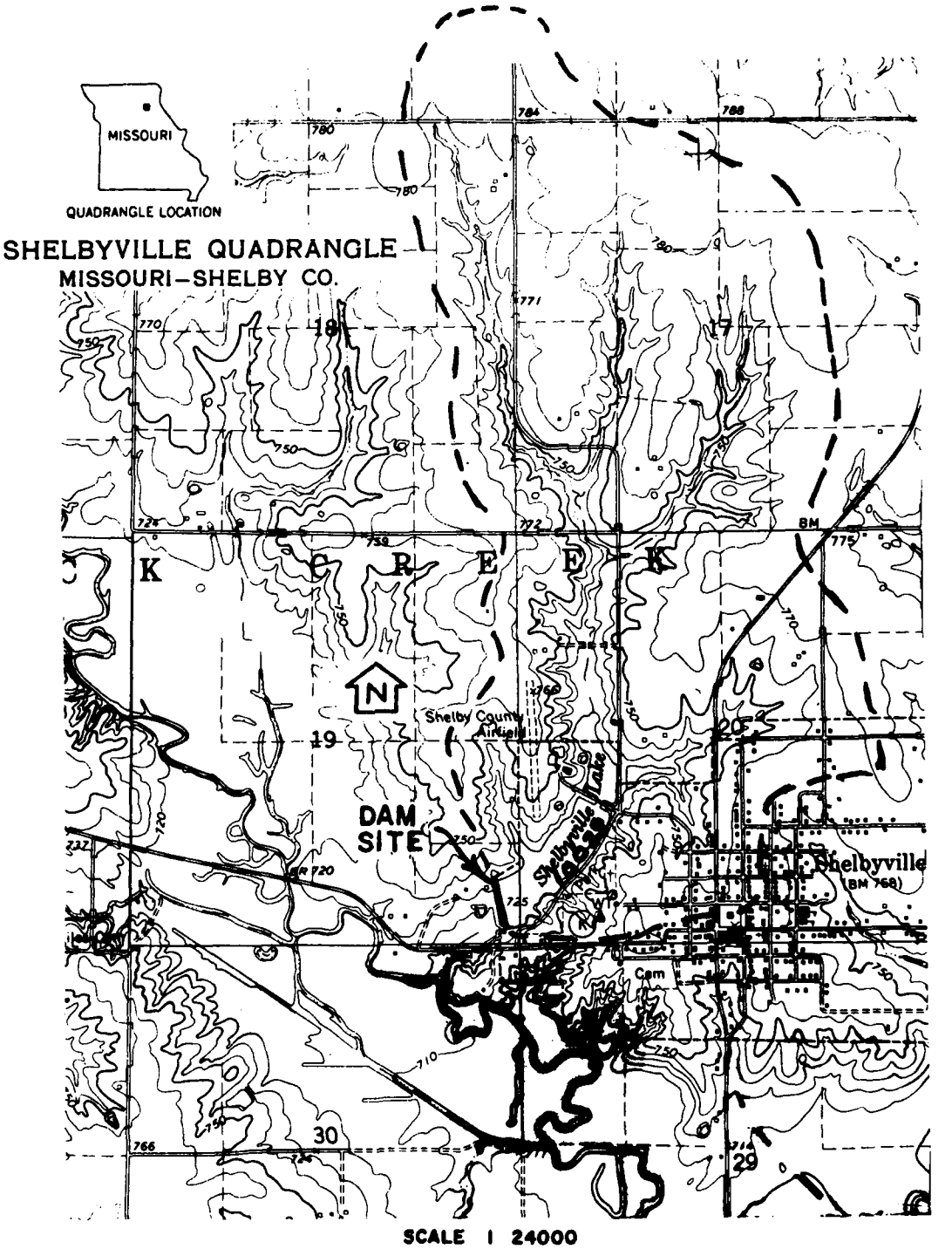
Photo 15

Photo 16

APPENDIX B

HYDROLOGIC COMPUTATIONS

PLATE I, APPENDIX B



CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

DRAINAGE BOUNDARY — — — — —

SHELBYVILLE LAKE DAM (MO 10028)

DRAINAGE BASIN

B-2

DAM SAFETY INSPECTION / MISSOURI

SHEET NO. ___ OF ___

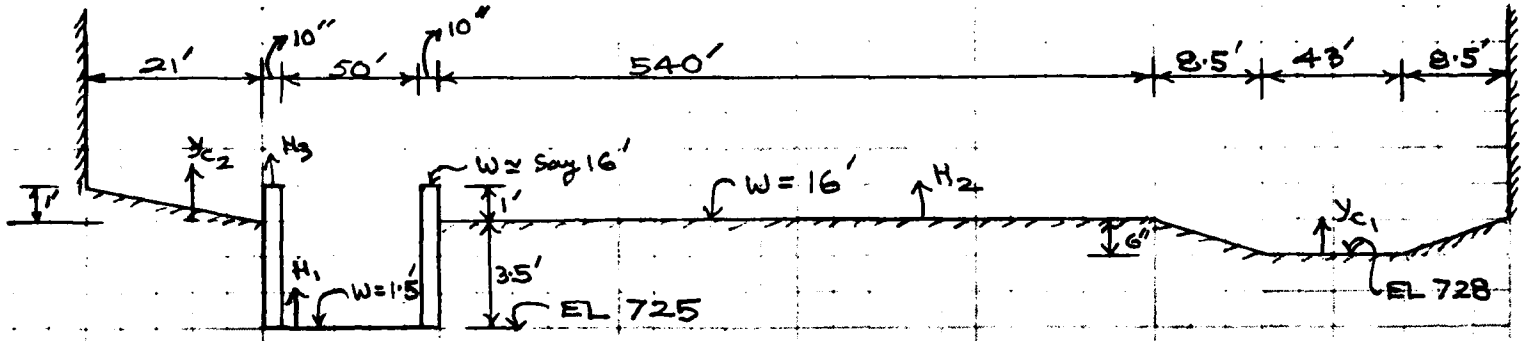
SHELBYVILLE LAKE DAM (MO. 10028)

JOB NO. 1240-001

SPILLWAY & OVERTOP RATING CURVE

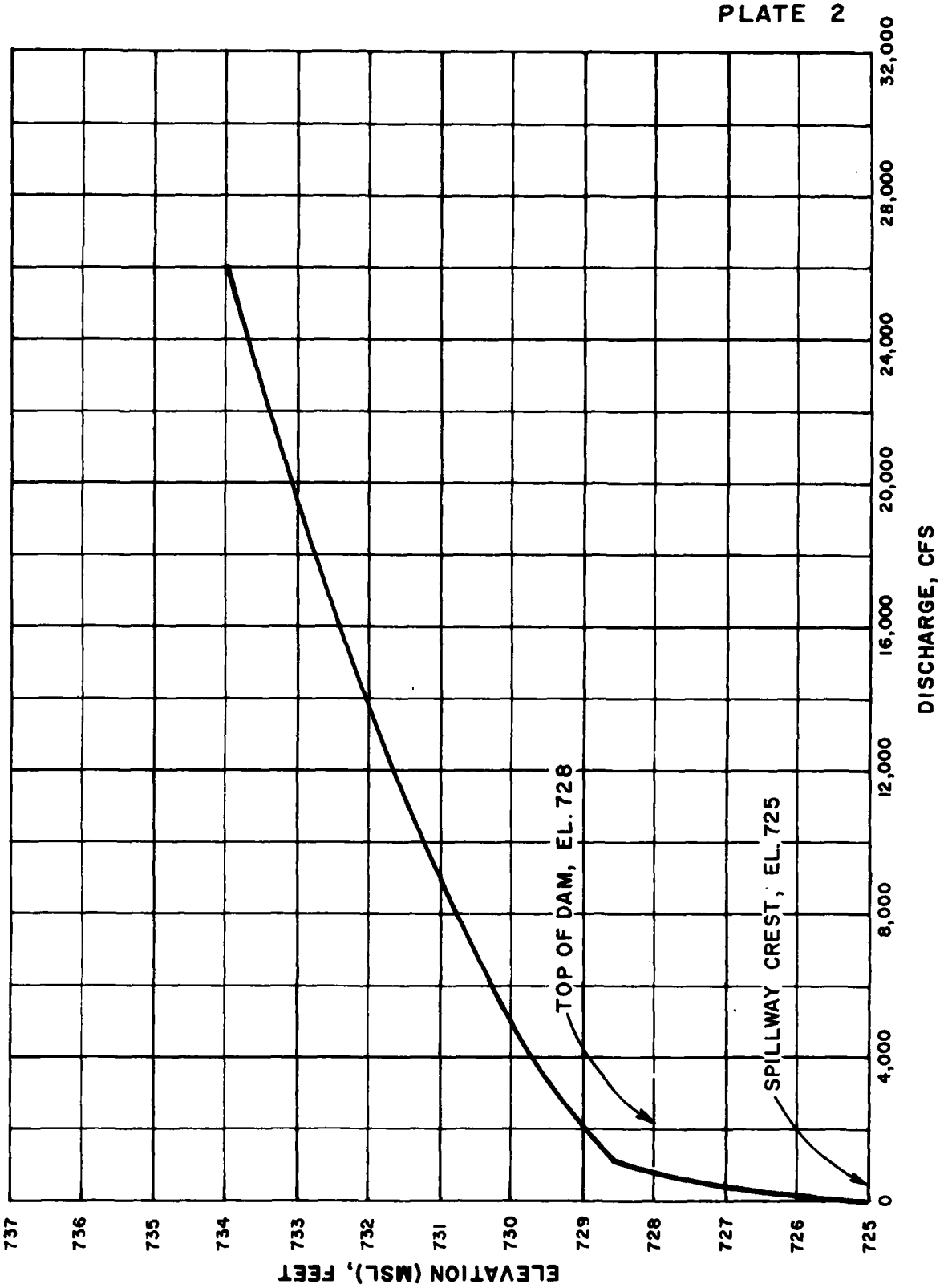
BY MAS DATE 9/6

B-3



H_1	L_1	C_1	$Q_1 = C_1 L_1 H_1^{3/2}$	U/S WS ELEV.	$\frac{1}{3}c = \frac{2}{3} \times (\text{U/S} - 728)$	T_{c_1}	A_{c_1}	$V_{c_1} = 5.27\sqrt{\frac{1}{3}c}$	$Q_{c_1} = V_{c_1} A_{c_1}$	H_2	L_2	C_2	Q_2	$y_{c_2} = \frac{2}{3} \times (\text{U/S} - 728.5)$	T_{c_2}	A_{c_2}	V_{c_2}	Q_{c_2}	H_3	L_3	C_3	Q_3	$Q_T = Q_2 + Q_3 + Q_1 + Q_{c_2}$
-	-	-	-	725	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2	50	3.03	429	727	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	429
3	50	3.32	863	728																			863
3.5	50	3.32	1087	728.5	.33	542	16	3.08	49	-	-	-	-	-	-	-	-	-	-	-	-	-	1136
4	50	3.32	1328	729	.67	60	36	4.39	158	.5	540	2.68	512	.33	7.0	1.17	2.81	3	-	-	-	-	2001
6	50	3.32	2440	731	2	60	1158	7.88	912	2.5	540	2.63	5614	1.67	21	24.6	6.18	150	1.5	1.1	2.68	9.24	9124
9	50	3.32	4482	734	4	60	2358	11.24	2650	5.5	540	2.63	18319	3.67	21	66.5	10.09	671	4.5	1.7	26.93	26.65	26165

PLATE 2



SHELBYVILLE LAKE DAM (MO. 10028)
SPILLWAY & OVERTOP RATING CURVE

B-4

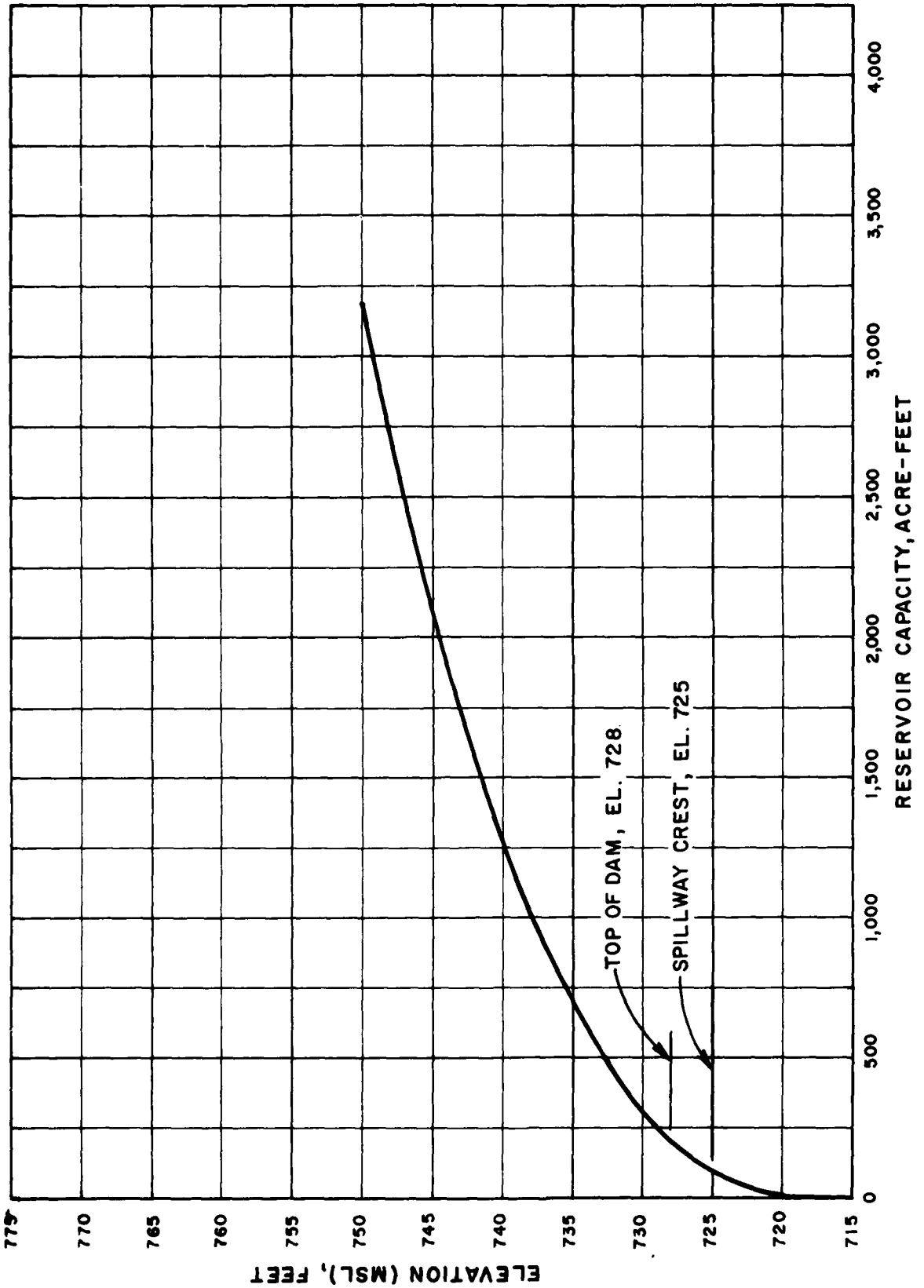
DAM SAFETY INSPECTION - MISSOURI SHEET NO. 1 OF
SHELBYVILLE LAKE DAM # 10028 JOB NO. 1240
RESERVOIR AREA CAPACITY BY DNZ DATE 31/5/
MRR ✓
MLG ✓

SHELBYVILLE LAKE DAM

RESERVOIR AREA CAPACITY

ELEV. M S L (ft)	RESERVOIR SURFACE AREA (ACRES)	INCREMENTAL VOLUME (AC-Ft)	TOTAL VOLUME (AC-Ft)	REMARKS
715	0	0	0	Est. Streambed Elev. at Dam
725	29	97	97	U.S. as shown on U.S.G.S. maps (Elev. Known) SPILLWAY CREST
728	48	114	211	Top of dam
730	66	114	325	
740	135	985	1310	
750	245	1873	3183	

PLATE 3



SHELBYVILLE LAKE DAM (MO. 10028)
RESERVOIR CAPACITY CURVE

B-6

DAM SAFETY INSPECTION — SHEET NO. 1 OF
SHELBYVILLE LAKE DAM (10028) — JOB NO. 1240-001-1
PROBABLE MAXIMUM PRECIPITATION — BY PRW/MLB ✓ DATE 8-17-2

DAM # MO. 10028

DETERMINATION OF PMP

1) DETERMINE DRAINAGE AREA OF BASIN

D.A. = 1156 AC

2) DETERMINE PMP INDEX RAINFALL

(200 SQ MI, 24 HR. DURATION)

LOCATION OF CENTROID OF BASIN

LONG 92° 02' 41"
LAT 39° 49' 22"

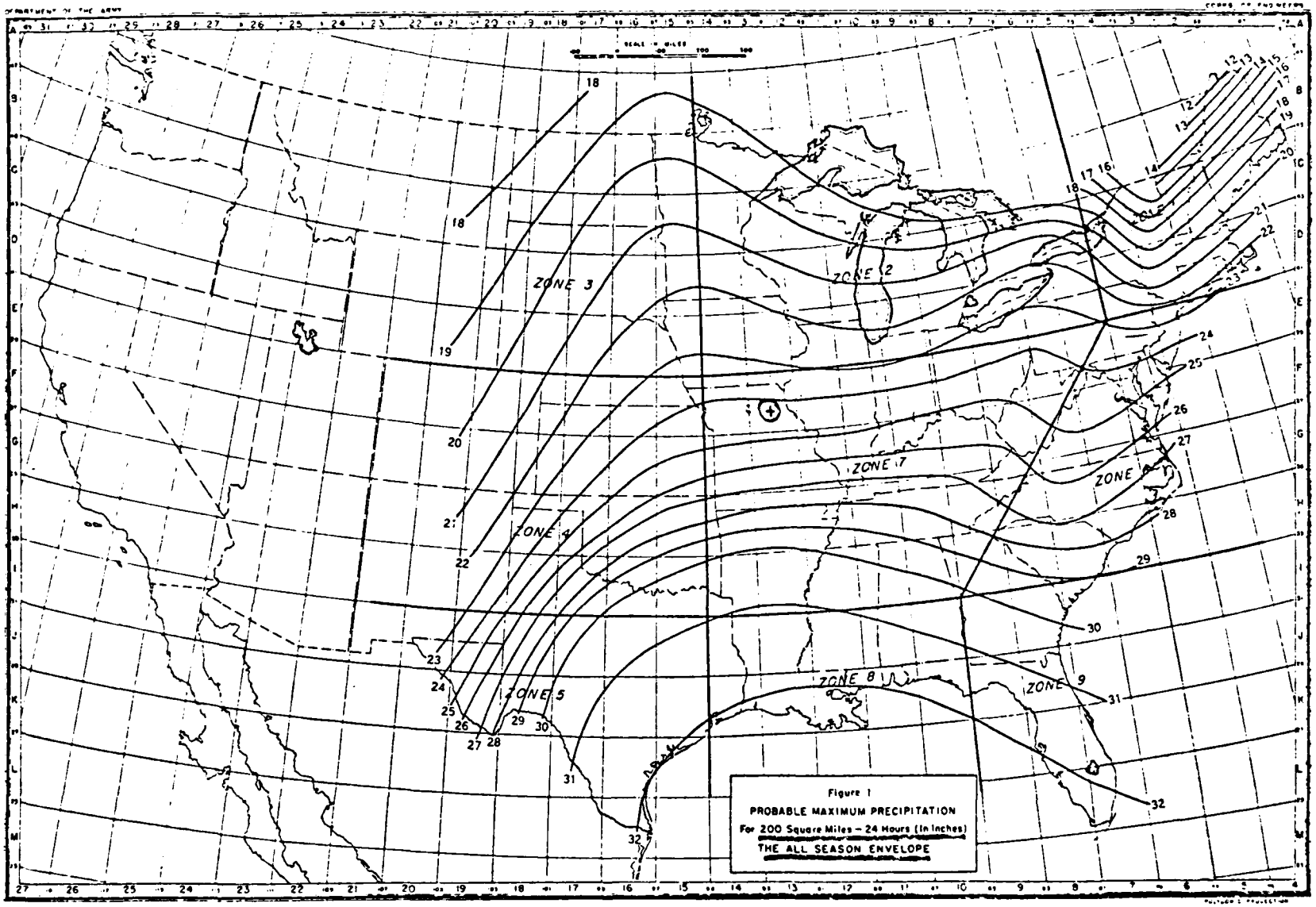
} PMP INDEX RAINFALL = 24.3"

3) DETERMINE BASIN RAINFALL IN TERMS OF PERCENTAGE OF PMP INDEX RAINFALL FOR VARIOUS DURATIONS:

LOCATION LONG 92° 02' 41"
LAT 39° 49' 22"

⇒ ZONE 7

DURATION (HR.)	PERCENT OF INDEX RAINFALL	TOTAL RAINFALL (IN)	RAINFALL INCREMENTS	DURATION OF INCREMENTS
6	100	24.3	24.3	6
12	120	29.2	4.9	6
24	130	31.6	2.4	12


ZONE 1
ZONE 2
ZONE 3
ZONE 4
ZONE 5
ZONE 6
ZONE 7
ZONE 8
ZONE 9
Figure 1
PROBABLE MAXIMUM PRECIPITATION
For 200 Square Miles – 24 Hours (In Inches)
THE ALL SEASON ENVELOPE

B-8

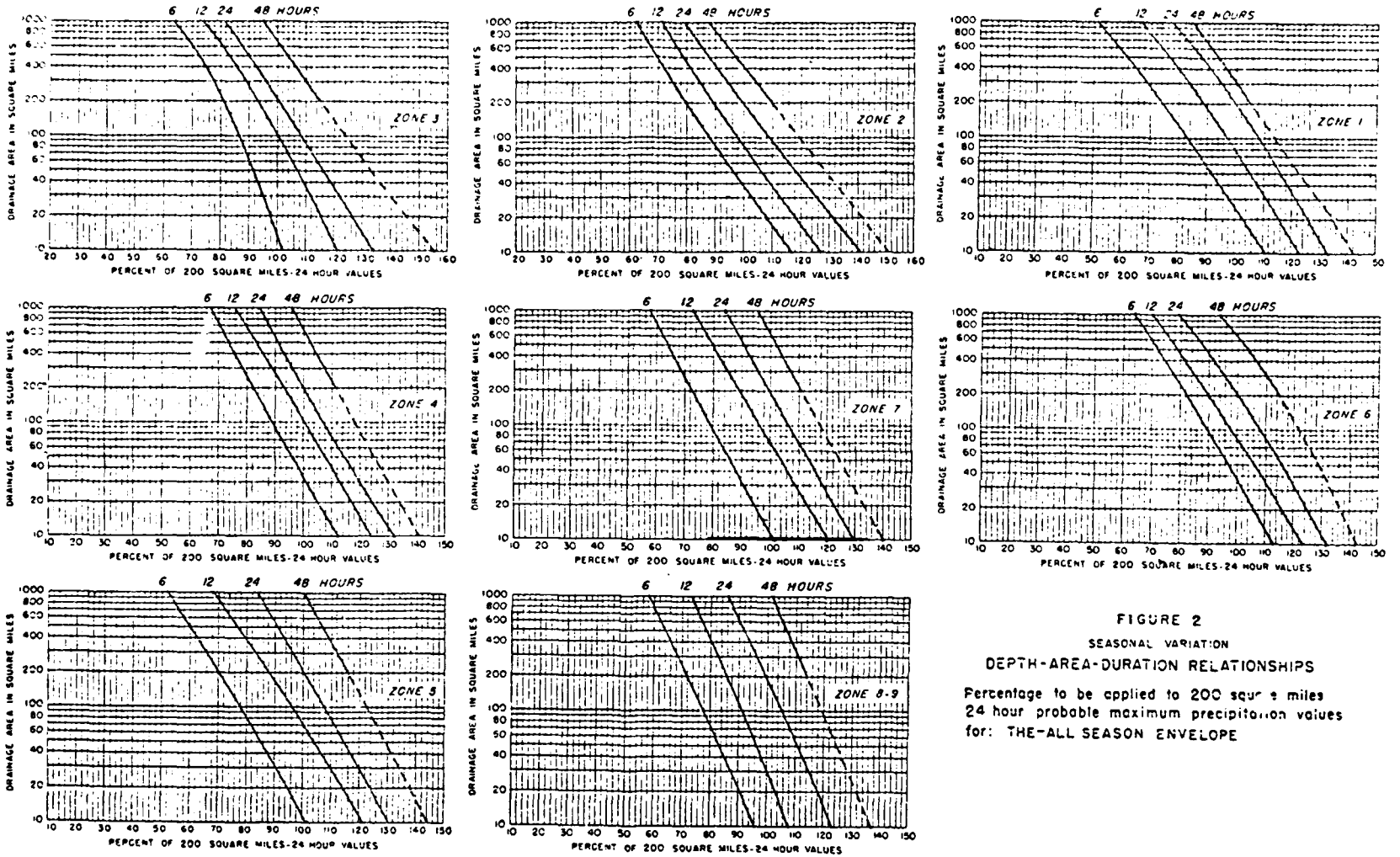


FIGURE 2

SEASONAL VARIATION

DEPTH-AREA-DURATION RELATIONSHIPS

Percentage to be applied to 200 square miles 24 hour probable maximum precipitation values for: THE-ALL SEASON ENVELOPE

1) DRAINAGE AREA = 1156 AC = 1.81 SQ. MI.

2) LENGTH OF STREAM = (5" x 2000') = 10,000 FT = 1.9 MI.

3) ELEVATION AT DRAINAGE DIVIDE ALONG LONGEST WATER COURSE = H_1 = 793 FT

4) RESERVOIR ELEVATION AT SPILLWAY CREST = H_2 = 725 FT

5) DIFFERENCE IN ELEVATION = $\Delta H = H_1 - H_2 = 793 - 725 = 68$ FT

6) AVERAGE SLOPE OF STREAM = $\frac{\Delta H}{L} = \frac{68}{10000} = 0.68\%$

7) TIME OF CONCENTRATION

a) By KIRPICH FORMULA

$$T_c = \left(\frac{11.9 \times L^3}{\Delta H}\right)^{0.385} = \left(\frac{11.9 \times 1.9^3}{68}\right)^{0.385}$$

T_c = 1.07 HR

b) By VELOCITY ESTIMATE

AVERAGE SLOPE 0.68% ⇒ V = 2 FPS

$T_c = \frac{L}{V} = \frac{10000}{2 \times 3600} = 1.39$ HR

USE T_c = 1.07 HR

8) LAG TIME = $0.6 \times T_c = 0.6 \times 1.07 = 0.64$ HR

9) UNIT DURATION $D \leq \frac{L_t}{3} = \frac{0.64}{3} = 0.21$ HR

USE D = 5 MIN = 0.083 HR

10) TIME TO PEAK $T_p = \frac{D}{2} + L_t = \frac{0.083}{2} + 0.64 = 0.68$ HR

11) PEAK DISCHARGE $q_p = \frac{484 \times A}{T_p} = \frac{484 \times 1.81}{0.68} = 1288$ CFS

ECI-4 PRC ENGINEERING CONSULTANTS, INC.

DAM SAFETY INSPECTION - MISSOURI SHEET NO. 1 OF

SHELBYVILLE LAKE DAM (10028) JOB NO. 1240-001.1

SOIL GROUP AND CURVE NUMBER DETERMINATION BY KLB DATE 8-4

SHELBYVILLE LAKE DAM (10028)

HYDROLOGIC SOIL GROUP AND CURVE NUMBER

1. WATERSHED SOILS IN THIS BASIN CONSIST PRIMARILY OF GROUP D SOILS. ASSUME GROUP D FOR HYDROLOGIC PURPOSES FOR THE ENTIRE WATERSHED.

2. THIS WATERSHED IS PRIMARILY PASTURE AND RANGELAND, WITH ABOUT 10% IN AN URBAN AREA, AND 10% IN FORESTED LANDS. ASSUME THE HYDROLOGIC CONDITION OF THIS WATERSHED IS "FAIR".

THUS CN = 84 (PASTURE AND RANGE) 80%

CN = 79 (WOODED AREAS) 10%

CN = 90 (URBAN) 10%

FOR A WEIGHTED AVERAGE OF

CN = 84 WITH AMC II

⇒ CN = 93 WITH AMC III

HEC1DB INPUT DATA

```
****************************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION       JULY 1978
 LAST MODIFICATION  26 FEB 79
****************************************
   1   A1                  DAM SAFETY INSPECTION - MISSOURI
   2   A2                  SHELBYVILLE LAKE DAM (MO.10028)
   3   A3                     PMF AND 50 PERCENT PMF
   4   B    300       0       5       0       0       0       0       0       0
   5   B1     5
   6   J      1       2       1
   7   J1     1      .5
   8   M      0   10028
   9   K1   INPUT PRECIPITATION VALUES, RATIOS AND UNIT HYDROGRAPH PARAMETERS
  10   M      1       2    1.81            1.81       1
  11   P           24.7     110     120     130
  12   T                                                      -1     -93
  13   W2           .54
  14   X      0       0       1
  15   K      1   10028
  16   K1   ROUTE HYDROGRAPH THROUGH SHELBYVILLE LAKE DAM
  17   Y                              1       1
  18   Y1                                                   -725      -1
  19   Y4   725     727     728   728.5     729     731     734
  20   Y5     0     429     863    1136    2001    9124   26160
  21   $S     0      97     211     325    1410    3183
  22   $E   715     725     728     730     740     750
  23   $$   725
  24   $D   733
  25   $L    99
```

INFLOW PMF AND ONE-HALF PMF HYDROGRAPHS

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT 10033
ROUTE HYDROGRAPH TO 10028
END OF NETWORK

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION:  26 FEB 79
**********

RUN DATE= 79/09/27.
     TIME= 17.12.22.
```

DAM SAFETY INSPECTION - MISSOURI
SHELBYVILLE LAKE DAM (NO.10028)
PMF AND 50 PERCENT PMF

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	ASTAN
300	0	5	0	0	0	0	0	0	0

JOPER	NWT	LROPT	TRACE
0	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 2 LRTIO= 1

RTIOS= 1.00 .50

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INPUT PRECIPITATION VALUES, RATIOS AND UNIT HYDROGRAPH PARAMETERS

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
10028	0	0	0	0	0	0	0	

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	1.81	0.00	1.31	1.00	0.000	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	24.30	100.00	120.00	130.00	0.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	-1.00	-93.00	0.00	0.00

CURVE NO = -93.00 MOISTNESS = -1.00 EFFECT CN = -93.00

UNIT HYDROGRAPH DATA
TC= 0.00 LAG= .64

RECESSION DATA
STRTQ= 0.00 QRCSN= 0.00 RTIOR= 1.00

UNIT HYDROGRAPH 45 END OF PERIOD ORDINATES, TC= 0.00 HOURS, LAG= .64 VOL= 1.00

68.	130.	346.	580.	868.	1099.	1236.	1280.	1248.	1172.
1087.	914.	735.	580.	474.	387.	322.	265.	216.	177.

	1464.	120.	77.	80.	65.	53.	44.	36.	30.	24.
	20.	16.	14.	12.	10.	8.	6.	5.	4.	3.

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.05	1	.01	0.00	.01	0.	1.01	12.35	151	.20	.20	.00	1515.
1.01	.10	2	.01	0.00	.01	0.	1.01	12.40	152	.20	.20	.00	1686.
1.01	.15	3	.01	0.00	.01	0.	1.01	12.45	153	.20	.20	.00	1856.
1.01	.20	4	.01	0.00	.01	0.	1.01	12.50	154	.20	.20	.00	2013.
1.01	.25	5	.01	0.00	.01	0.	1.01	12.55	155	.20	.20	.00	2155.
1.01	.30	6	.01	0.00	.01	0.	1.01	13.00	156	.20	.20	.01	2278.
1.01	.35	7	.01	0.00	.01	0.	1.01	13.05	157	.24	.24	.00	2380.
1.01	.40	8	.01	0.00	.01	0.	1.01	13.10	158	.24	.24	.00	2465.
1.01	.45	9	.01	0.00	.01	0.	1.01	13.15	159	.24	.24	.01	2544.
1.01	.50	10	.01	0.00	.01	0.	1.01	13.20	160	.24	.24	.00	2620.
1.01	.55	11	.01	0.00	.01	0.	1.01	13.25	161	.24	.24	.00	2699.
1.01	1.00	12	.01	.00	.01	0.	1.01	13.30	162	.24	.24	.00	2780.
1.01	1.05	13	.01	.00	.01	0.	1.01	13.35	163	.24	.24	.01	2860.
1.01	1.10	14	.01	.00	.01	0.	1.01	13.40	164	.24	.24	.00	2936.
1.01	1.15	15	.01	.00	.01	1.	1.01	13.45	165	.24	.24	.00	3008.
1.01	1.20	16	.01	.00	.01	1.	1.01	13.50	166	.24	.24	.00	3072.
1.01	1.25	17	.01	.00	.01	2.	1.01	13.55	167	.24	.24	.01	3128.
1.01	1.30	18	.01	.00	.01	4.	1.01	14.00	168	.24	.24	.00	3177.
1.01	1.35	19	.01	.00	.01	6.	1.01	14.05	169	.30	.30	.00	3219.
1.01	1.40	20	.01	.00	.01	9.	1.01	14.10	170	.30	.30	.00	3262.
1.01	1.45	21	.01	.00	.01	12.	1.01	14.15	171	.30	.30	.00	3309.
1.01	1.50	22	.01	.00	.01	15.	1.01	14.20	172	.30	.30	.00	3365.
1.01	1.55	23	.01	.00	.01	19.	1.01	14.25	173	.30	.30	.00	3435.
1.01	2.00	24	.01	.00	.01	23.	1.01	14.30	174	.30	.30	.00	3517.
1.01	2.05	25	.01	.00	.01	27.	1.01	14.35	175	.30	.30	.00	3603.
1.01	2.10	26	.01	.00	.01	31.	1.01	14.40	176	.30	.30	.00	3691.
1.01	2.15	27	.01	.01	.01	35.	1.01	14.45	177	.30	.30	.00	3776.
1.01	2.20	28	.01	.01	.01	39.	1.01	14.50	178	.30	.30	.01	3854.
1.01	2.25	29	.01	.01	.01	43.	1.01	14.55	179	.30	.30	.00	3924.
1.01	2.30	30	.01	.01	.01	47.	1.01	15.00	180	.30	.30	.00	3984.
1.01	2.35	31	.01	.01	.01	51.	1.01	15.05	181	.18	.18	.01	4026.
1.01	2.40	32	.01	.01	.01	55.	1.01	15.10	182	.37	.37	.00	4054.
1.01	2.45	33	.01	.01	.01	59.	1.01	15.15	183	.37	.37	.00	4077.
1.01	2.50	34	.01	.01	.01	62.	1.01	15.20	184	.55	.55	.00	4109.
1.01	2.55	35	.01	.01	.01	66.	1.01	15.25	185	.65	.65	.00	4172.
1.01	3.00	36	.01	.01	.01	69.	1.01	15.30	186	1.57	1.57	.00	4364.
1.01	3.05	37	.01	.01	.01	72.	1.01	15.35	187	2.58	2.58	.00	4788.
1.01	3.10	38	.01	.01	.01	76.	1.01	15.40	188	1.02	1.01	.00	5499.
1.01	3.15	39	.01	.01	.01	79.	1.01	15.45	189	.65	.65	.00	6460.
1.01	3.20	40	.01	.01	.01	82.	1.01	15.50	190	.55	.55	.00	7667.
1.01	3.25	41	.01	.01	.01	84.	1.01	15.55	191	.37	.37	.00	8945.
1.01	3.30	42	.01	.01	.01	87.	1.01	16.00	192	.37	.37	.00	10001.
1.01	3.35	43	.01	.01	.01	90.	1.01	16.05	193	.28	.28	.00	10688.
1.01	3.40	44	.01	.01	.01	92.	1.01	16.10	194	.28	.28	.00	10986.
1.01	3.45	45	.01	.01	.01	95.	1.01	16.15	195	.28	.28	.00	10922.
1.01	3.50	46	.01	.01	.01	97.	1.01	16.20	196	.28	.28	.00	10521.
1.01	3.55	47	.01	.01	.01	99.	1.01	16.25	197	.28	.28	.00	9920.
1.01	4.00	48	.01	.01	.00	102.	1.01	16.30	198	.28	.28	.00	9159.
1.01	4.05	49	.01	.01	.00	104.	1.01	16.35	199	.28	.28	.00	8307.
1.01	4.10	50	.01	.01	.00	106.	1.01	16.40	200	.28	.28	.00	7536.
1.01	4.15	51	.01	.01	.00	108.	1.01	16.45	201	.28	.28	.00	6911.
1.01	4.20	52	.01	.01	.00	110.	1.01	16.50	202	.28	.28	.00	6376.
1.01	4.25	53	.01	.01	.00	111.	1.01	16.55	203	.28	.28	.00	5980.
1.01	4.30	54	.01	.01	.00	113.	1.01	17.00	204	.28	.28	.00	5695.

1.01	4.35	55	.01	.01	.00	115.	1.01	17.05	205	.22	.22	.00	5298.
1.01	4.40	56	.01	.01	.00	117.	1.01	17.10	206	.22	.22	.00	5045.
1.01	4.45	57	.01	.01	.00	118.	1.01	17.15	207	.22	.22	.00	4829.
1.01	4.50	58	.01	.01	.00	120.	1.01	17.20	208	.22	.22	.00	4632.
1.01	4.55	59	.01	.01	.00	121.	1.01	17.25	209	.22	.22	.00	4445.
1.01	5.00	60	.01	.01	.00	123.	1.01	17.30	210	.22	.22	.00	4270.
1.01	5.05	61	.01	.01	.00	124.	1.01	17.35	211	.22	.22	.00	4106.
1.01	5.10	62	.01	.01	.00	125.	1.01	17.40	212	.22	.22	.00	3955.
1.01	5.15	63	.01	.01	.00	127.	1.01	17.45	213	.22	.22	.00	3819.
1.01	5.20	64	.01	.01	.00	128.	1.01	17.50	214	.22	.22	.00	3699.
1.01	5.25	65	.01	.01	.00	129.	1.01	17.55	215	.22	.22	.00	3595.
1.01	5.30	66	.01	.01	.00	130.	1.01	18.00	216	.22	.22	.00	3507.
1.01	5.35	67	.01	.01	.00	132.	1.01	18.05	217	.02	.02	.00	3424.
1.01	5.40	68	.01	.01	.00	133.	1.01	18.10	218	.02	.02	.00	3331.
1.01	5.45	69	.01	.01	.00	134.	1.01	18.15	219	.02	.02	.00	3215.
1.01	5.50	70	.01	.01	.00	135.	1.01	18.20	220	.02	.02	.00	3061.
1.01	5.55	71	.01	.01	.00	136.	1.01	18.25	221	.02	.02	.00	2853.
1.01	6.00	72	.01	.01	.00	137.	1.01	18.30	222	.02	.02	.00	2603.
1.01	6.05	73	.07	.05	.01	142.	1.01	18.35	223	.02	.02	.00	2380.
1.01	6.10	74	.07	.05	.01	143.	1.01	18.40	224	.02	.02	.00	2050.
1.01	6.15	75	.07	.05	.01	145.	1.01	18.45	225	.02	.02	.00	1776.
1.01	6.20	76	.07	.06	.01	191.	1.01	18.50	226	.02	.02	.00	1523.
1.01	6.25	77	.07	.06	.01	230.	1.01	18.55	227	.02	.02	.00	1296.
1.01	6.30	78	.07	.06	.01	279.	1.01	19.00	228	.02	.02	.00	1106.
1.01	6.35	79	.07	.06	.01	335.	1.01	19.05	229	.02	.02	.00	952.
1.01	6.40	80	.07	.06	.01	394.	1.01	19.10	230	.02	.02	.00	831.
1.01	6.45	81	.07	.06	.01	457.	1.01	19.15	231	.02	.02	.00	732.
1.01	6.50	82	.07	.06	.01	513.	1.01	19.20	232	.02	.02	.00	651.
1.01	6.55	83	.07	.06	.01	562.	1.01	19.25	233	.02	.02	.00	584.
1.01	7.00	84	.07	.06	.01	608.	1.01	19.30	234	.02	.02	.00	529.
1.01	7.05	85	.07	.06	.01	647.	1.01	19.35	235	.02	.02	.00	484.
1.01	7.10	86	.07	.06	.01	679.	1.01	19.40	236	.02	.02	.00	447.
1.01	7.15	87	.07	.06	.01	707.	1.01	19.45	237	.02	.02	.00	417.
1.01	7.20	88	.07	.06	.01	731.	1.01	19.50	238	.02	.02	.00	392.
1.01	7.25	89	.07	.06	.01	752.	1.01	19.55	239	.02	.02	.00	371.
1.01	7.30	90	.07	.06	.01	771.	1.01	20.00	240	.02	.02	.00	355.
1.01	7.35	91	.07	.06	.00	786.	1.01	20.05	241	.02	.02	.00	341.
1.01	7.40	92	.07	.06	.00	800.	1.01	20.10	242	.02	.02	.00	330.
1.01	7.45	93	.07	.06	.00	812.	1.01	20.15	243	.02	.02	.00	321.
1.01	7.50	94	.07	.06	.00	823.	1.01	20.20	244	.02	.02	.00	314.
1.01	7.55	95	.07	.06	.00	832.	1.01	20.25	245	.02	.02	.00	307.
1.01	8.00	96	.07	.06	.00	841.	1.01	20.30	246	.02	.02	.00	303.
1.01	8.05	97	.07	.06	.00	848.	1.01	20.35	247	.02	.02	.00	299.
1.01	8.10	98	.07	.06	.00	855.	1.01	20.40	248	.02	.02	.00	295.
1.01	8.15	99	.07	.06	.00	860.	1.01	20.45	249	.02	.02	.00	293.
1.01	8.20	100	.07	.06	.00	866.	1.01	20.50	250	.02	.02	.00	290.
1.01	8.25	101	.07	.06	.00	871.	1.01	20.55	251	.02	.02	.00	288.
1.01	8.30	102	.07	.06	.00	875.	1.01	21.00	252	.02	.02	.00	287.
1.01	8.35	103	.07	.06	.00	879.	1.01	21.05	253	.02	.02	.00	285.
1.01	8.40	104	.07	.06	.00	882.	1.01	21.10	254	.02	.02	.00	284.
1.01	8.45	105	.07	.06	.00	886.	1.01	21.15	255	.02	.02	.00	284.
1.01	8.50	106	.07	.06	.00	889.	1.01	21.20	256	.02	.02	.00	284.
1.01	8.55	107	.07	.06	.00	892.	1.01	21.25	257	.02	.02	.00	284.
1.01	9.00	108	.07	.07	.00	894.	1.01	21.30	258	.02	.02	.00	284.
1.01	9.05	109	.07	.07	.00	896.	1.01	21.35	259	.02	.02	.00	284.
1.01	9.10	110	.07	.07	.00	898.	1.01	21.40	260	.02	.02	.00	284.
1.01	9.15	111	.07	.07	.00	901.	1.01	21.45	261	.02	.02	.00	284.
1.01	9.20	112	.07	.07	.00	902.	1.01	21.50	262	.02	.02	.00	284.
1.01	9.25	113	.07	.07	.00	904.	1.01	21.55	263	.02	.02	.00	284.
1.01	9.30	114	.07	.07	.00	906.	1.01	22.00	264	.02	.02	.00	284.

1.01	9.35	115	.07	.07	.00	907.	1.01	22.05	.65	.02	.02	.00	284.
1.01	9.40	116	.07	.07	.00	908.	1.01	22.10	265	.02	.02	.00	284.
1.01	9.45	117	.07	.07	.00	910.	1.01	22.15	267	.02	.02	.00	284.
1.01	9.50	118	.07	.07	.00	911.	1.01	22.20	268	.02	.02	.00	284.
1.01	9.55	119	.07	.07	.00	912.	1.01	22.25	269	.02	.02	.00	284.
1.01	10.00	120	.07	.07	.00	913.	1.01	22.30	270	.02	.02	.00	284.
1.01	10.05	121	.07	.07	.00	914.	1.01	22.35	271	.02	.02	.00	284.
1.01	10.10	122	.07	.07	.00	915.	1.01	22.40	272	.02	.02	.00	284.
1.01	10.15	123	.07	.07	.00	916.	1.01	22.45	273	.02	.02	.00	284.
1.01	10.20	124	.07	.07	.00	917.	1.01	22.50	274	.02	.02	.00	284.
1.01	10.25	125	.07	.07	.00	918.	1.01	22.55	275	.02	.02	.00	284.
1.01	10.30	126	.07	.07	.00	919.	1.01	23.00	276	.02	.02	.00	284.
1.01	10.35	127	.07	.07	.00	920.	1.01	23.05	277	.02	.02	.00	284.
1.01	10.40	128	.07	.07	.00	921.	1.01	23.10	278	.02	.02	.00	284.
1.01	10.45	129	.07	.07	.00	921.	1.01	23.15	279	.02	.02	.00	284.
1.01	10.50	130	.07	.07	.00	922.	1.01	23.20	280	.02	.02	.00	284.
1.01	10.55	131	.07	.07	.00	923.	1.01	23.25	281	.02	.02	.00	284.
1.01	11.00	132	.07	.07	.00	923.	1.01	23.30	282	.02	.02	.00	284.
1.01	11.05	133	.07	.07	.00	924.	1.01	23.35	283	.02	.02	.00	284.
1.01	11.10	134	.07	.07	.00	924.	1.01	23.40	284	.02	.02	.00	284.
1.01	11.15	135	.07	.07	.00	925.	1.01	23.45	285	.02	.02	.00	284.
1.01	11.20	136	.07	.07	.00	926.	1.01	23.50	286	.02	.02	.00	284.
1.01	11.25	137	.07	.07	.00	926.	1.01	23.55	287	.02	.02	.00	284.
1.01	11.30	138	.07	.07	.00	927.	1.02	0.00	288	.02	.02	.00	284.
1.01	11.35	139	.07	.07	.00	927.	1.02	.05	284	0.00	0.00	0.00	282.
1.01	11.40	140	.07	.07	.00	928.	1.02	.10	252	0.00	0.00	0.00	279.
1.01	11.45	141	.07	.07	.00	928.	1.02	.15	241	0.00	0.00	0.00	272.
1.01	11.50	142	.07	.07	.00	928.	1.02	.20	232	0.00	0.00	0.00	260.
1.01	11.55	143	.07	.07	.00	929.	1.02	.25	223	0.00	0.00	0.00	242.
1.01	12.00	144	.07	.07	.00	929.	1.02	.30	214	0.00	0.00	0.00	220.
1.01	12.05	145	.20	.20	.00	937.	1.02	.35	205	0.00	0.00	0.00	195.
1.01	12.10	146	.20	.20	.00	962.	1.02	.40	296	0.00	0.00	0.00	169.
1.01	12.15	147	.20	.20	.00	1038.	1.02	.45	297	0.00	0.00	0.00	144.
1.01	12.20	148	.20	.20	.00	1236.	1.02	.50	298	0.00	0.00	0.00	120.
1.01	12.25	149	.20	.20	.00	1282.	1.02	.55	299	0.00	0.00	0.00	98.
1.01	12.30	150	.20	.20	.00	1344.	1.02	1.00	300	0.00	0.00	0.00	80.
									SUM	31.59	30.70	.89	429816.
										(802.)(780.)(22.)(12171.03)			

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	10986.	4595.	1992.	1433.	429757.
CMS	311.	130.	42.	41.	12169.
INCHES		23.55	30.68	30.68	30.68
MM		598.23	779.18	779.18	779.18
AC-FT		2272.	2960.	2960.	2960.
THOUS CU M		2803.	3651.	3651.	3651.

HYDROGRAPH AT STA 11028 FOR PLAN 1, RTIO 1

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
0.	0.	0.	0.	1.	1.	2.	4.	6.	9.	
12.	15.	19.	23.	27.	31.	35.	39.	43.	47.	
51.	55.	59.	62.	66.	69.	72.	76.	79.	82.	
84.	87.	90.	92.	95.	97.	99.	102.	104.	106.	
108.	110.	111.	113.	115.	117.	118.	120.	121.	123.	
124.	125.	127.	128.	129.	130.	132.	133.	134.	135.	
136.	137.	140.	149.	165.	191.	230.	279.	335.	394.	
455.	510.	562.	608.	647.	679.	707.	731.	752.	771.	

786.	800.	817.	825.	832.	841.	848.	855.	860.	866.	
871.	875.	879.	882.	886.	889.	892.	894.	896.	899.	
901.	902.	904.	906.	907.	909.	910.	911.	912.	913.	
914.	915.	916.	917.	918.	919.	920.	921.	921.	922.	
923.	924.	924.	925.	926.	926.	927.	927.	927.	928.	
928.	928.	929.	929.	937.	962.	1008.	1086.	1202.	1349.	
1515.	1686.	1856.	2013.	2156.	2278.	2380.	2465.	2544.	2620.	
2699.	2781.	2865.	2936.	3009.	3072.	3129.	3177.	3219.	3262.	
3309.	3365.	3435.	3517.	3603.	3681.	3776.	3854.	3924.	3984.	
4026.	4054.	4077.	4100.	4172.	4354.	4788.	5499.	6460.	7667.	
8945.	10021.	10688.	10986.	10922.	10521.	9920.	9159.	8307.	7536.	
6901.	6376.	5950.	5595.	5298.	5045.	4829.	4632.	4445.	4270.	
4105.	3955.	3813.	4688.	3595.	3507.	3424.	3331.	3215.	3061.	
2858.	2605.	2330.	2130.	1776.	1523.	1298.	1106.	952.	831.	
732.	651.	584.	529.	484.	447.	417.	392.	371.	355.	
341.	330.	321.	314.	307.	303.	299.	295.	293.	290.	
286.	287.	285.	284.	284.	284.	284.	284.	284.	284.	
284.	284.	284.	284.	284.	284.	284.	284.	284.	284.	
284.	284.	284.	284.	284.	284.	284.	284.	284.	284.	
284.	284.	284.	284.	284.	284.	284.	284.	282.	279.	
272.	263.	240.	220.	195.	169.	140.	120.	98.	80.	

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	10986.	4583.	1493.	1433.	429757.
CMS	311.	130.	42.	41.	12169.
INCHES		23.68	30.68	30.68	30.68
MM		598.23	779.18	779.18	779.18
AC-FT		2372.	2960.	2960.	2960.
THOUS CU M		2903.	3651.	3651.	3651.

HYDROGRAPH AT STA 10008 FOR PLAN 1, RTIO 2

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	1.	1.	2.	3.	4.
6.	7.	9.	11.	13.	15.	17.	20.	22.	24.
26.	27.	29.	31.	33.	35.	36.	38.	39.	41.
42.	44.	45.	46.	47.	49.	50.	51.	52.	53.
54.	55.	56.	57.	57.	58.	59.	60.	61.	61.
62.	63.	63.	64.	65.	65.	66.	66.	67.	67.
68.	69.	71.	74.	82.	95.	115.	139.	167.	197.
227.	255.	281.	304.	323.	340.	354.	366.	376.	385.
393.	400.	406.	411.	416.	420.	424.	427.	430.	433.
435.	437.	439.	441.	443.	444.	446.	447.	448.	449.
453.	453.	453.	453.	454.	454.	455.	456.	456.	457.
457.	458.	458.	459.	459.	460.	460.	460.	461.	461.
461.	462.	462.	462.	463.	463.	463.	463.	464.	464.
464.	464.	464.	465.	469.	481.	504.	543.	601.	675.
767.	865.	928.	1007.	1078.	1139.	1190.	1235.	1272.	1310.
1350.	1390.	1430.	1468.	1504.	1536.	1564.	1588.	1610.	1631.
1654.	1682.	1718.	1758.	1802.	1845.	1888.	1927.	1962.	1992.
2013.	2027.	2039.	2054.	2086.	2177.	2394.	2749.	3230.	3834.
4473.	5001.	5344.	5493.	5461.	5261.	4960.	4580.	4154.	3768.
3451.	3188.	2975.	2798.	2649.	2523.	2414.	2316.	2222.	2135.
2053.	1978.	1910.	1850.	1798.	1754.	1712.	1666.	1608.	1530.
1427.	1302.	1165.	1025.	888.	762.	649.	553.	476.	415.
366.	326.	292.	264.	242.	223.	208.	196.	186.	177.
171.	166.	160.	157.	154.	151.	149.	148.	146.	145.
144.	143.	143.	142.	142.	142.	142.	142.	142.	142.
142.	142.	142.	142.	142.	142.	142.	142.	142.	142.

142.	142.	142.	142.	142.	142.	142.	142.	142.	142.	
142.	142.	142.	142.	142.	142.	142.	142.	141.	139.	
136.	130.	121.	110.	98.	85.	72.	60.	49.	40.	

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5693.	2291.	746.	710.	21487.
CMS	156.	65.	21.	20.	608.
INCHES		11.78	15.34	15.34	15.34
MM		299.11	389.59	389.59	389.59
AC-FT		1156.	1490.	1490.	1480.
THOUS CU M		1401.	1825.	1825.	1825.

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HYDROGRAPH ROUTING

ROUTE HYDROGRAPH THROUGH SHELBYVILLE LAKE DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
10028	1	0	0	0	0	0	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
0	0	0	0.000	0.000	0.000	-725.	-1

STAGE	725.00	727.00	728.00	728.50	729.00	731.00	734.00
FLOW	0.00	429.00	863.00	1136.00	2501.00	9124.00	26165.00
CAPACITY=	0.	97.	211.	325.	1310.	3183.	
ELEVATION=	715.	725.	728.	730.	740.	750.	

CREL	SPWID	COGW	EXPW	ELEVL	COGL	CAREA	EXPL
725.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
728.0	3.0	0.0	0.

STATION 10028, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDIN

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
1.	2.	2.	3.	4.	5.	6.	7.	8.	10.
11.	13.	14.	16.	18.	20.	22.	24.	26.	28.
30.	32.	34.	36.	39.	41.	43.	45.	47.	50.
52.	54.	56.	58.	60.	62.	65.	67.	69.	71.
73.	75.	77.	79.	80.	82.	84.	86.	88.	90.
91.	93.	95.	97.	99.	102.	104.	112.	119.	129.
140.	153.	167.	183.	200.	218.	236.	254.	273.	292.

SUMMARY OF PMF AND ONE-HALF PMF FLOOD ROUTING

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1 1.00	RATIO 2 .50
HYDROGRAPH AT	1 028	1.81	1	10886.	5485.
		(4.69)		(311.78)(	155.34)(
ROUTED TO	10??	1.81	1	9728.	5111.
		(4.69)		(275.49)(	144.72)(

RATIOS APPLIED TO FLOWS

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	725.00	725.00	728.50
S10-AGE	97.	97.	211.
OUTFLOW	0.	0.	855.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	731.11	3.11	954.	9728.	9.25	15.42	0.00
.59	729.47	1.97	518.	5111.	4.08	16.33	0.00

PERCENT OF PMF FLOOD ROUTING
EQUAL TO SPILLWAY CAPACITY

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT	10C28
ROUTE HYDROGRAPH TO	10C28
END OF NETWORK	

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**********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION       JULY 1978
   1ST MODIFICATION  26 FEB 79
**********************************

 RUN  DATE= 79/09/27.
      TIME= 07.30.37.


                                DAM SAFETY INSPECTION - MISSOURI
                              SHELBYVILLE LAKE DAM (MO.10038)
                                      PERCENT PMF

                                    JOB SPECIFICATION
        NO      NHR     NMIN     IDAY     IHR     IMIN    METRC     IPLT     IPRT    NSTAN
       300       0        5        0       0        0        0        0        4        0
                          JOPER      NMT    LROPT    TRACE
                              0        0        0        0

                          MULTI-PLAN ANALYSES TO BE PERFORMED
                              NPLAN= 1  NRTIO= 5  LRTIO= 1
                    RTIOS=    .10      .11      .12      .13      .14

**********      **********      **********      **********      **********

                                SUB-AREA RUNOFF COMPUTATION

                    INPUT PRECIPITATION VALUES, RATIOS AND UNIT HYDROGRAPH PARAMETERS

                          ISTAQ    ICOMP    IECON    ITAPE    JPLT     JPRT    INAME    ISTAGE    IAUTO
                          10028        0        0        0       0        0        0         0        0

                                        HYDROGRAPH DATA
                    IHYDG    IUHG    TAREA     SNAP     TRSDA    TRSPC    RATIO    ISNOW    ISAME    LOCAL
                        1               1.81     0.00      1.81     1.00    0.000        0        0        0

                                          PRECIP DATA
                              SPFE      PMS       R6       R12      R24      R48      R72      R96
                                0.00    24.30   100.00   120.00   130.00     0.00     0.00     0.00

                                          LOSS DATA
                    LROPT    STRKR    DLTKR    RTIOL    ERAIN    STRKS    RTIOK    STRTL    CNSTL    ALSMX    RTIMP
                        0     0.00     0.00     1.00     0.00     0.00     1.00    -1.00   -93.00     0.00     0.00

                    CURVE NO =   -93.00  WETNESS =   -1.00  EFFECT CN =   93.00

                                      UNIT HYDROGRAPH DATA
                                TC=  0.00    LAG=   .64

                                      RECESSION DATA
                                STRTQ=    1.00    QRCSN=    0.00    RTIOR= 1.00

                                    END-OF-PERIOD FLOW
                    HR.MN  PERIOD   RAIN   EXCS   LOSS   COMP Q       MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS   COMP Q
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SUM 51. 0 30.70 .80 429016.
(.02)(7[illegible](22.8(12171.03)

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HYDROGRAPH ROUTING

ROUTE HYDROGRAPH THROUGH SHELBYVILLE LAKE DAM

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
10028	1	0	0	0	0	0	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.[illegible]	0.00	1	1	0	0	0

NSTPS	NSTOL	LAG	AMSKK	X	TSK	STORA	ISPRAT
0	0	0	0.000	0.000	0.000	-725.	-1

STAGE	725.00	727.00	728.00	729.50	729.00	731.00	734.00
FLOW	0.00	429.00	862.00	1134.00	2001.00	9129.00	21167.00
CAPACITY=	0.	77.	211.	325.	1316.	5185.	
ELEVATION=	715.	725.	728.	730.	740.	750.	

CPEL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
735.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	TAMDID
735.0	0.0	0.0	0.

PEAK OUTFLOW IS 519. AT TIME 16.83 HOURS

PEAK OUTFLOW IS 730. AT TIME 16.83 HOURS

PEAK OUTFLOW IS 787. AT TIME 16.83 HOURS

PEAK OUTFLOW IS 869. AT TIME 16.75 HOURS

PEAK OUTFLOW IS 939. AT TIME 16.75 HOURS

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PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOW IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS				
				RATIO 1 .10	RATIO 2 .11	RATIO 3 .12	RATIO 4 .13	RATIO 5 .14
HYDROGRAPH AT	10024	1.81	1	1099.	1204.	1318.	1428.	1538.
		(4.69)		(31.11)(	34.20)(	37.33)(	40.44)(	43.55)(
ROUTED TO	10025	1.81	1	619.	725.	787.	859.	939.
		(4.69)		(17.53)(	19.95)(	22.73)(	24.61)(	26.60)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ..... INITIAL VALUE SPILLWAY CREST TOP OF DAM

	ELEVATION	725.00	725.00	728.20
	STORAGE	97.	97.	211.
	OUTFLOW	0.	0.	852.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	727.44	0.00	131.	419.	0.00	16.83	0.00
.11	727.65	0.00	197.	705.	0.00	16.83	0.00
.12	727.85	0.00	264.	797.	0.00	16.83	0.00
.13	728.01	.01	212.	669.	.58	16.75	0.00
.14	728.14	.14	219.	639.	1.00	16.75	0.00

B-30